

TROPICAL DISEASES BULLETIN

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THE MANAGEMENT OF SCHISTOSOMIASIS

by

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Historical

Despite the various methods employed in the treatment of bilharziasis it was not until 1918 that the use of antimony in the disease became generally recognized. Of the earlier drugs, emetine is the most worthy of mention, since it cured about 15 per cent. of cases; but it never proved popular as it was considered too toxic for general out-patient use. In 1915 McDONAGH published a report on the value of tartar emetic (potassium antimony tartrate) which became the established treatment in 1918 when CHRISTOPHERSON worked out a standard course. It consisted of 12 intravenous injections given on alternate days over a period of four weeks. Confirmatory reports soon established antimony as a drug of specific value. But the potassium salt possessed too many unpleasant side effects and it was soon to be replaced by sodium antimony tartrate (SAT), which to this day remains one of the best trivalent preparations. SAT, however, still has disadvantages, in particular its long course of administration and unpleasant side effects, which are not uncommonly quite severe no matter how carefully the drug is given. These include vomiting, tightness in the chest, collapse, arthralgia, dermatitis, jaundice and herpes zoster. Occasionally the drug produces a fatal reaction.

It is not surprising, therefore, that scientists set to work to find an improved antimonial preparation and in 1929 introduced a trivalent one called Fouadin which could be given intramuscularly. It produced few or no side effects, was well tolerated and could be given to children in whom veins were difficult to find. The course was also shorter, and although the first reports were promising 40 per cent. of cases relapsed or remained uncured. Then Anthiomaline (lithium antimony-thiomalate), a trivalent salt, appeared in 1936. This too was intended for intramuscular injection and CAWSTON in South Africa was one of the first to refer to its usefulness in the disease.

For the next decade workers continued to employ these three drugs,

but it was quite clear that a more rapid treatment was essential if it was hoped to treat bilharziasis on a large scale with any hope of success, and in 1945 ALVES in Southern Rhodesia introduced the intensive method, which was followed up by many workers, some of whom modified it in order to reach a safe and reliable treatment along the same lines.

More recently, efforts were made to treat the disease orally with antimony (trivalent antimony gluconate) but it was disappointing. However, the first successful attempt to treat the disease orally emanated from experiments made during the late war by German workers who found that the thioxanthones (Miracil) were active against *S. mansoni* in mice and monkeys. Since then interesting trials with Miracil D (lucanthone hydrochloride) have been carried out in Southern Rhodesia, Egypt and elsewhere.

Criteria of Cure

Before detailing the different drugs and their dosages it is necessary to draw attention to the lack of unanimity of opinion as to what constitutes a cure. Unfortunately opinion on this point varies and until this is settled it is difficult to assess the claims of a particular drug. The problem is not simple.

The rate of cure as determined today depends on the standard accepted by the particular worker. Some believe that the patient is cured if after treatment (generally after 6 weeks) he passes no eggs whatever, alive or dead. The opposite school of thought considers that a cure has been achieved if the ova passed are not viable. The cure rate in the latter event is much higher than in the former where the standard is stricter. In a recent paper, FRIEDHEIM *et al.* (1954) point out that the presence of dead ova in the excreta does not exclude the presence of living worms, but indicates that the deposition of ova is seriously impaired. ERFAN and TALAAT (1950) also state that dead ova passed after antimony treatment may be due to the presence of living worms, and GIRGIS and AZIZ (1948), also of Egypt, are of a like opinion. They consider a successful cure to mean that the subject ceases to pass living or dead ova by the end of the third week after the last injection. On the other hand BLAIR, HALAWANI and others maintain that a cure is judged by the absence of viable ova when at least three hatching-out tests for miracidia in the urine are negative. FAIRLEY (1951) too infers that cure depends on the absence of viable ova. "Absence of viable ova from the excreta for 3 months has been suggested as a reasonable period to estimate cure, but I agree with CHRISTOPHERSON'S view that the minimum time of follow-up should be 1 year."

My own opinion is that a cure can only be assumed when for practical purposes all ova have disappeared about 6 weeks after the treatment has been completed. When ova are dead and deposited in the submucosa a layer of fibrous tissue soon forms around them, thus rendering their escape difficult. A few may escape for a short time but not in large numbers or for very long, and if dead ova are passed regularly after 6 weeks a cure cannot be assumed. If ova are extruded as foreign bodies it seems difficult to explain the rarity of ova in the sputum, because it is well known that large numbers are held up in the lungs, often close to the alveoli. Moreover, a person with *S. haematobium* infection passes ova in the urine, but it is the exception to find terminal-spined ova in the stool, despite the fact that large numbers can often be found in a mucosal snip taken from the rectum. The constant extrusion of ova from these tissues indicates a vital process, the ovum still being alive and secreting a substance to create a passage for its exit. Two criteria of cure are suggested:

- (1) the disappearance of clinical symptoms;
- (2) the permanent absence of ova from the excreta 6 weeks after the completion of treatment.

Selection of the Drug

When selecting a drug the following factors should be taken into consideration:

- (1) Age.
- (2) Sex.
- (3) Race.
- (4) Whether the disease is in an early or late stage and if it is complicated by other diseases.
- (5) The environment of the patient. Will he submit to treatment and is he likely to become reinfected?
- (6) Whether the treatment is part of a mass treatment or for a single case.
- (7) The particular type of schistosome parasite.

These factors are so variable that considerable judgment should be exercised in every case when selecting the drug. As a rule the dose for a woman is smaller than for a man. In young children veins that will tolerate repeated injections are not easy to find. When dealing with patients who will not attend for a long course of injections, or when large numbers are being treated where facilities are few, it is preferable to prescribe a short treatment and if possible one that can be given by mouth.

Treatment with Antimony

Sodium antimony tartrate (SAT) is frequently employed. The standard therapy for an average man is 2 grains by intravenous injection every second day, commencing with $\frac{1}{2}$ grain, 1 grain, $1\frac{1}{2}$ grains, followed by 12 injections of 2 grains each. Children should not receive a larger dose than $\frac{3}{4}$ –1 grain at a time, but adolescents may be given 2 grains. The course generally lasts for 4 to 5 weeks, reaching a total dosage of 27 grains for an adult; 20 grains for a child of 15; 16 grains for a child of 12; and 8 to 12 grains for younger children. Females receive slightly smaller doses than these.

The antimony is administered in isotonic saline or a 5 per cent. glucose solution. The injection is given slowly and is usually administered on a relatively empty stomach 3 to 4 hours after a light meal, to minimize the tendency to vomiting. Reactions may be due to the drug itself or to toxins liberated by disintegrating worms, and 25 mgm. of Phenergan 3 times a day may reduce these reactions. Persistent vomiting, diarrhoea, rapid pulse and jaundice are indications that the treatment should be stopped. Patients with a good constitution can report at the surgery, but those who are weak or easily upset by the injections should rest in bed as much as possible during the course of treatment and should be permitted to perform only light duties.

The slow treatment is probably the safest and possibly the most effective, but the chief disadvantages are the duration of the course and the side effects, such as tightness in the chest, arthralgia, cough and vomiting which often render it inadvisable to continue with the treatment. Many practitioners in Southern Rhodesia prefer to give Anthiomaline by the intravenous route since it is often better tolerated by the patient than SAT. The adult dose is 3 cc. three times a week to a total of 48 cc. and for a child under 10 years 2 cc. three times a week to a total of 40 cc. Like SAT it is contra-indicated in the presence of hepatic or serious renal disease.

Once popular, Fouadin (a 6.3 per cent. aqueous isotonic solution containing 8.5 mgm. of trivalent antimony per cc.) is still used in certain instances and is administered intramuscularly. It is suitable for children and is less toxic than SAT. Unfortunately even when a total dosage of 80 cc. has been received the patient may relapse. It is said to be quite useful for *S. japonicum*. The standard Fouadin scheme of treatment was evolved in Egypt by KHALIL in 1928. For adults the first injection is 1.5 cc., the second 3 cc. and the third and subsequent injections 5 cc. The first 3 injections are given on successive days and the rest every other day. The total adult dose is about 40 cc. Efforts have been made to intensify the injections and thus still further shorten the treatment. This is achieved by starting with 3.5 cc., followed by 8 to 11 or more injections of 5 cc. each, the first 3 or even 5 being administered daily.

Anthiomaline has advantages similar to those of Fouadin and may be given intramuscularly or even intravenously, as mentioned previously. It may cause severe pain at the site of injection and, uncommonly, may produce severe side reactions. It is given intramuscularly in doses of 3-4 cc. into the upper and outer quadrant of the buttock, the site being well massaged after the injection. For adults the dosage commences with 1 cc. and increases by 1 cc. every other day until a dose of 4 cc. has been reached. Thereafter 4 cc. are given twice weekly until a total of 48 cc. has been administered. For a child of 12 the initial dose is 0.5 cc. and the injection is increased by 0.5 cc. until the full strength of 1.5 or 2 cc. is reached.

Intensive Treatment

In 1945 ALVES of Southern Rhodesia introduced the intensive method largely for mass treatment in endemic regions. It is given only to those in good health and is contra-indicated when there is liver, renal and cardiac disease or anaemia. The Alves treatment consists of a total dosage of 12 mgm. per kgm. of body weight, administered in 7-8 doses over a period of 30 hours, with a break of 16-18 hours after the first day of treatment. SAT is employed and the total dose for an adult of average weight is about 12 grains.

A variation of this method (GIRGIS and AZIZ, 1948) is to give the drug, to about the same total dose, at 8 a.m., 11 a.m. and 2 p.m. on each of 2 successive days. Each injection contains about 2 grains. The drug is given in 10 cc. of 5 per cent. glucose-saline at a rate not exceeding 2 cc. per minute. It thus takes about 5 minutes to administer, and the patient is confined to bed for the treatment. GIRGIS and AZIZ (1948) and others have found that severe reactions may result and that the cure rate obtained was 67 per cent., that is, cure rate with the Alves treatment is much the same as when the conventional short treatment is adopted.

Once it was shown that large amounts of antimony could be given over a short period efforts were made to modify the original treatment and as a result several modified intensive treatments have been introduced. They are:

(1) TALAAT and SHOAB (1947) advocate 4 intravenous injections each of 2 grains of SAT 6 hours apart on two successive days.

(2) GIRGIS and AZIZ (1948) later give 6 injections on 6 successive days, calculating their total on the basis of 12 mgm. for each kgm. body weight, and obtain almost the same cure rate as Alves.

(3) MILLS (1946) administers daily intramuscular injections of Anthiomaline for 6 days on each of 2 successive weeks.

(4) HALAWANI and ABDALLAH (1946) employ Repodral (similar to Fouadin) for their intensive treatment, the total dosage being 0.5 cc. per kgm. body-weight. Six injections of 5 cc. each are given at intervals of 3 hours, 3 times a day for 2 successive days. They claim 73 per cent. of cures with this course.

(5) Recently a trivalent sodium antimony gluconate (TSAG) preparation has been introduced in the treatment of bilharziasis and ERFAN and TALAAAT (1950) report satisfactory cures when it is given intravenously. The salt is dissolved in ice-cold distilled water and must be given immediately. For an adult weighing 60 kgm. the course consists of a daily intravenous injection of 180 mgm. given in 3 cc. distilled water for 6 successive days. The total dosage is calculated on the basis of about 20 mgm. per kgm. body weight. There is a striking absence of coughing with this treatment and vomiting and urticaria occur only occasionally. Further, the duration of the treatment is only 6 days.

Treatment with Lucanthone (Miracil D)

In Rhodesia high cure rates are reported in *S. haematobium* infection with lucanthone (Miracil D or Nilodin), the total dose being calculated to about 60 mgm. per kgm. body weight divided into 6 doses (two daily for three days). The following scheme is advocated by BLAIR and by ALVES (ALVES, 1949, 1950). (Each tablet of Nilodin equals 0.5 gm.) A child from 6 to 10 years old, weighing 66 pounds, would receive 1 tablet (0.5 gm.) in the morning and another in the evening on the first day, and the same on the second, followed by half a tablet morning and evening on the third day, the total dose being 2.5 gm. For a child aged between 10 and 14, weighing 110 pounds, the total dose is 3 gm., the patient receiving 1 tablet morning and evening every day for 3 successive days. A young adult weighing 132 pounds is given $1\frac{1}{2}$ tablets the first morning followed by 1 tablet the same evening, and 1 tablet morning and evening on each of the two subsequent days, the total dosage being 3.25 gm. A heavy adult weighing 180 lb. is given a total dose of 5.5 gm., receiving 2 tablets morning and evening each of the 2 first days and the third morning, and 1 tablet on the third evening.

In Egypt NEWSOME and HALAWANI (1950) recommend 1 gm. twice daily, morning and evening for 3 days, the course being repeated monthly for 3 months.

The drug cures about 60 per cent. of patients infected with *S. haematobium*, but is hardly effective for the other types of schistosome. It exerts a specific lethal action on the urinary schistosome and its ease of administration and saving of working time are its great advantages. However, its side effects, such as vomiting, anorexia, colic, light-headedness, and temporary mental confusion, may be so severe that the patient may refuse to, or be unable to, complete the treatment. It is claimed that antihistamines, such as promezathine (Phenergan), administered with the drug, tend to lessen these effects. Efforts have been made to cloak the tablet with an enteric sugar coating, but in Southern Rhodesia this appears to interfere with its absorption. The taste of the uncoated tablets may be fairly well disguised by jam.

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SUMMARY OF RECENT ABSTRACTS *

III. MALARIA †

General

An issue of the *An. Inst. Med. Trop.* (Lisbon) (p. 453) is devoted to an account of the First National Congress on Tropical Medicine (Malaria), and contains papers relating to Portuguese and other territories.

In the Summary of Recent Abstracts, III Malaria [this *Bulletin*, 1954, v. 51, 331, paragraph 2, line 10] the word "sexual" is incorrect; the passage should read "it acts on the young asexual forms".

Epidemiology

SHUTE (p. 759) discusses indigenous malaria in Britain, all known cases of which, except one, were due to *P. vivax*. *Anopheles maculipennis atroparvus* was the probable vector in most cases, but *A. plumbeus* has probably been responsible for some, including 2 recent cases in London described by CROCKETT and SIMPSON (p. 132). [See also SHIBATA, SATO *et al.*, and BRUNETTI, below.] FAIRLEY (p. 132) strongly emphasizes the importance of suspecting malaria in troops who have returned to Britain after service abroad.

The incidence of malaria in the Middle East is now relatively low. GRAMICCIA (p. 342) shows, however, that it still exists in most parts of Lebanon, and that severe outbreaks could occur. He gives a list of anophelines found there. DDT house spray appears to have effected a marked reduction in spleen and parasite rates in some areas. The spraying

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1954, v. 51. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

† For previous articles on malaria in this series see the March issues of the *Tropical Diseases Bulletin* each year since 1939.

of strips of wall 30 cm. wide separated by unsprayed strips of the same width is effective and economical.

P. malariae infection is much more common in Somalia than has hitherto been believed, but MOISE (p. 133) points out that it is well tolerated though persistent.

A malaria survey of Douala, Cameroons, is reported by CAPPONI (p. 133). The spleen and parasite rates in young children were 13.7 and 28.7 per cent., respectively. Few control measures have been possible.

A brief account of malaria in the Belgian Congo, to be read in conjunction with a nosological map, has been published by GILLET (p. 525). CHARDOME *et al.* (pp. 525, 526) have used scarification of the skin in the scapular region for preparing slides for the discovery of malaria parasites, and have found this method more sensitive than the usual thick drop or smear. They report on findings near Lake Tanganyika, in the Belgian Congo, and in Urundi. Infections were rare over 2,000 metres above sea level.

JASWANT SINGH *et al.* (p. 1138) give an account of the prevalence of the various species of malaria parasites in India.

Malaria (predominantly quartan) is common in the Maldive islands, spleen rates rising to 70 per cent. in places. IYENGAR *et al.* (p. 134) show that *A. tessellatus* is the vector, breeding in the numerous shallow wells of the atolls.

Hospital records indicate that in a place in north Viet-Nam *P. vivax* is by far the commonest malaria parasite, with *P. falciparum* rather less than half as frequently found, and *P. malariae* third (BAUGÉ, p. 1140). SOULAGE and RICHET (p. 1139) give an account of the incidence of malaria in troops operating in Indo-China north-west of Hanoi, and in some of the indigenous people who re-entered the area after having fled from it into the malarious mountain regions. The vectors are *A. minimus* and *A. aconitus*.

In the New Hebrides the degree of malaria varies from hypo-endemic to hyper-endemic; *A. farauti* is the vector, and BLACK (p. 1214) notes that here it is endophilic. In the Trobriand Islands, however, he comments that it is exophilic and that its breeding places are unusual for this species. He reports on surveys of these two island groups. LAIRD (p. 1215) found malaria, and *A. farauti*, on Anteityum, on the fringe of the malarious area of the south-west Pacific.

SHIBATA (p. 1141) states that although large numbers of persons were repatriated to Japan at the end of the war, of whom about 22 per cent. were potentially infective sources of malaria, no epidemics occurred. There was apparently nothing in the type of malaria in these people which could explain this failure of epidemic spread. On the other hand, SATO *et al.* (p. 1214) report an outbreak of *P. vivax* malaria from a similar source in southern Japan, where the local vector was *A. hyrcanus* var. *sinensis*. Similarly BRUNETTI (p. 454) describes an outbreak of *P. vivax* malaria in a group of girl campers in California who had not previously been infected. The source of infection was evidently a veteran of the Korean war with relapsing malaria, and local anophelines must have carried it. The incubation or latent period was 226–307 days in 25 of the 34 cases.

In the Annual Report of the Malaria Division, Trinidad (p. 134), it is shown that the number of deaths from malaria fell from 602 in 1943 to 80 in 1952. Most of the infections diagnosed in the laboratories originated in an area where *A. bellator* is the vector. Where *A. aquasalis* is responsible for transmission (it is a weak vector) DDT house spray seems to be better than BHC. Dieldrin has been used in oil as a larvicide, with success. Bromeliad control is carried out by special units, and copper sulphate is used for the purpose.

UREÑA HERNÁNDEZ and GAÑÁN (p. 1215) report that malaria is hyper-endemic in the Dominican Republic, the vector being *A. albimanus*.

In Venezuela, certification in broad groups of the cause of death by lay registrars has recently been permitted. GABALDON (p. 343) produces evidence to show that the information obtained in this way has considerable value in relation to malaria.

MOLAS (p. 1030) records two outbreaks of malaria in northern Argentina, due to *P. vivax*, and notes that *A. albicans*, *A. darlingi* and *A. triannulatus* have been found.

Transmission

The late Major SENIOR-WHITE (p. 760), in one of the last of his long series of important papers, suggested that mosquitoes could be classified in 4 categories, according to their behaviour. The categories related to endophily, exophily, endophagy and exophagy, and definitions of these terms are given.

VAN THIEL (p. 1033) discusses trematode, gregarine and fungus parasites of anophelines.

WEYER (p. 1031) has issued a key to the female anophelines of Europe, North Africa and Western Asia, and their larvae.

BUONOMINI and MARIANI (p. 668) have proposed the erection of a sub-genus *Maculipennia* to include mosquitoes of the *maculipennis* complex of the genus *Anopheles*, including European and American species. FRIZZU (p. 454) reports a study of the salivary gland chromosomes of members of the *A. maculipennis* group; the arrangement of these chromosomes differs in the various races, confirming the morphological classification.

ROUBAUD (p. 4) and CALLOT (p. 1141) discuss the anophelines of the Vendée area of France. The former comments on the fact that *A. maculipennis messeae* and *A. m. typicus* have recently penetrated into what was a purely *A. m. atroparvus* zone, probably because a large number of German troops and their animals were present during the war, which changed the mode of living and housing of both man and animals.

Some 2 years after the end of the use of larvicides and residual spray campaigns in part of Sardinia, *A. m. labranchiae* (of which a few remained) had not greatly multiplied, but its haunts had been invaded by *A. hispaniola*, not previously found there. TRAPIDO and AITKEN (p. 248) suggest that the habits of *A. hispaniola* render it less susceptible than *A. m. labranchiae* to the action of residual insecticides and larvicides. CEFALÙ (p. 669) has found that *A. maculipennis labranchiae* in Sardinia tends to rest, not only in houses and animal shelters but also in crevices in rocks and under boulders in stream beds. This would explain why the residual insecticide programme has not been able to eradicate *A. m. labranchiae*, though it has been adequate for malaria control.

VUKASOVIĆ and MARTINOVIĆ (p. 5) found *A. maculipennis typicus*, *A. m. messeae* and *A. m. atroparvus* in a mountainous area of Yugoslavia; the first was the most common. These and *A. claviger*, *A. superpictus* and *A. plumbeus* are frequently found in Serbia (GUELMINO *et al.*, p. 1031). DETINOVA (p. 527) has estimated, by a method described, that the majority of female *A. maculipennis* in the Moscow region feed the same night as, and shortly after, they have laid eggs.

A list of anophelines observed in Yemen is given by MERUCCI (p. 1218).

Biological data on rice-field mosquitoes in part of Morocco are given in *Bull. Inst. Hyg. Maroc.* (p. 455). GAUD *et al.* (p. 455) have observed associations between certain anopheline and certain culicine larvae in Morocco; the presence of the culicine larvae in water may therefore provide

a good indication of the type of anopheline larvae likely to be found, even if the anophelines are temporarily absent.

WILSON (p. 1029) describes the work of the East African Malaria Unit in 1953. Studies on *A. gambiae* indicate that the number of feeding females may be as high as 48 per person at some seasons, and may be greatly reduced at others; in this area one person may receive 200 bites from presumably infective mosquitoes in a year, but in one place *A. gambiae* fed frequently on cattle and had a low sporozoite rate. The use of DDT or BHC on isolated estates in highly endemic areas does not appear effectively to reduce transmission of malaria.

Much work has been done on *A. gambiae* and *A. funestus* in East Africa. DRAPER and DAVIDSON (p. 4) have devised a method for estimating the survival rate in nature. The sporozoite rate in a batch of anophelines at the time of capture is lower than the rate found after the mosquitoes have been kept until all infected survivors show sporozoites, and the ratio between these two rates is directly proportional to the chance of survival from the time they receive an infective feed until sporozoites can be found. Calculated in this way, the average daily mortality is about 7 per cent. for *A. gambiae* and 8 per cent. for *A. funestus*. The same authors (p. 456) calculate that these anophelines produce about one sporozoite inoculation per person per night in that area of Tanganyika, but a study of infants indicates that one infective bite is received only once in $3\frac{1}{2}$ –4 months by each infant. The discrepancy between these rates is explained by assuming an immunity in infant life, the nature of which is uncertain but which protects against most infective bites. About 2 per cent. of all anopheline vectors feeding each night become infected. This transmission potential is so high that the authors estimate that it would be necessary to increase the daily mortality of the vectors from 7 per cent. to 45 or preferably 60 per cent. for effective control. This could be effected by residual spray with BHC (every 3 months) or dieldrin (perhaps every year).

GILLIES (p. 1032) describes his work on *A. gambiae* in which he divides females into 3 groups—pre-gravid, gravid, and gravid and infective. For a standard sporozoite rate he adopts the rate in the third group, noting that it varies inversely as the number of the biting anopheline population. Age-group changes within this population are responsible for short-term fluctuations in the sporozoite rate. Some workers in Africa have divided *A. gambiae* into races according to the number of maxillary teeth, but in East Africa GILLIES and SHUTE (p. 760) have found that environmental conditions during larval growth can exert so marked an effect on the maxillary index that this cannot be accepted as a criterion of biological races. On the other hand, MAILLOT (p. 1032), who also notes that the nature of the breeding places affects the maxillary index of *A. gambiae*, thinks that the dissimilarity in the indices which is shown to exist from period to period may be accounted for by the presence (around Brazzaville) of two or more races, the predominance of one or other being reflected in the rise and fall in the mean index. He thinks that one race is paucidentate and anthropophilic (and possibly exophilic)—and this includes the better vectors. The other race is multidentate and endophilic, but less anthropophilic—it includes weaker vectors.

GILLIES (pp. 1218, 1219) has made a study of the house-leaving and outside-resting habits of *A. gambiae* and *A. funestus* in East Africa. Few females leave the houses immediately after feeding but many do so during the second half of the 2-day gonotrophic cycle. Those which move out tend to rest in places marked by two layers of shade—high shade from trees or bushes, and local shade from the overhang of a bank or other similar shade.

They seldom feed on man outside houses, and all biting takes place after 8.30 p.m. In this work there was no evidence of distinct populations, one strictly domestic and the other tending to rest outside. Few of the mosquitoes leave the houses during the night. The author uses the ratio of fed to gravid females in houses to estimate the proportion of fed to gravid females which must be resting outside. He concludes that in the hot season when the interval between feeds is 2 days the house catches represent 70-75 per cent. of the *A. gambiae* and 80-85 per cent. of the *A. funestus* population.

A book on the anophelines of the Madagascar region has been prepared by DOUCET (p. 458); it includes information on malaria control measures.

RAGEAU *et al.* (p. 527) have made a preliminary study of the biology of *A. gambiae* in the South Cameroons.

In the Gold Coast MUIRHEAD-THOMSON (p. 528) found (as in the West Indies) that the infectivity of a person for mosquitoes is not simply related to the density of crescents. It is possible that cryptic infectors among older children and adults (*i.e.* those with low crescent densities) are more important than the less frequently bitten infecting infants. The same author (p. 5) has noted that although *A. gambiae* is a vector both of *Wuchereria bancrofti* and of malaria parasites in West Africa, it is rare to find a specimen infected with both simultaneously.

The anopheline mosquitoes of Liberia are discussed by GELFAND (p. 1217); *A. gambiae*, *A. melas*, *A. funestus* and (in some places) *A. nili* are important.

In north-west Pakistan a malaria survey revealed 12 species of anophelines, but NAQVI and QUTUB-UD-DIN (p. 759) could incriminate only *A. culicifacies* as a vector. Spleen rates varied from 2 to 79 per cent. A DDT campaign produced material results. The vector in Kabul, Afghanistan, appears to be *A. superpictus*, which hibernates during the winter (IYENGAR, p. 1220).

In an extensive study of anophelines in Mysore WORTH (p. 671) investigated the ratio of larvae to adults, noting considerable variations; this ratio is probably positively related to the longevity of the adults.

KRISHNAN (p. 249) gives a general account of *A. philippinensis*, and KRISHNASWAMI (p. 249) of *A. minimus*, in a series of articles dealing with the malaria vectors of India. *A. minimus* has been incriminated as the vector of malaria in Tripura and Manipur States, India (MISRA, p. 1142).

SHARMA (p. 761) has collected from the literature much information on *A. fluviatilis*, which breeds in clear water with moderate current—irrigation channels, rice fields and streams. It is anthropophilic in some parts and zoophilic in others, but where it is a vector malaria is usually hyperendemic. WORTH and SITARAMAN (p. 761) also emphasize the different traits exhibited by this mosquito in different areas. VEDAMANICKAM (p. 669) shows that it is normally a stream breeder, but that there is an adverse season when the density of breeding is comparatively higher in stagnant water. The mosquito is very susceptible to house-spray of DDT. In the foot-hills of part of India *A. fluviatilis* shows marked preference for human blood, and a sporozoite rate of 1.6 per cent. RAMAKRISHNAN and SATYA PRAKASH (p. 670) show that this mosquito is apparently more anthropophilic than it was some years ago, and suggest that there may be heterogeneous groups, some anthropophilic and some zoophilic, and that the prominence of the former depends on human contact.

In the Tarai, part of Uttar Pradesh, ISSARIS *et al.* (p. 136) found that malaria was moderately prevalent, and that the vectors were *A. culicifacies*

(during the monsoon) and *A. fluviatilis* before and after the monsoon. *A. fluviatilis* shows an anthropophilic index of over 40 per cent.

Records of precipitin tests on batches of *A. maculatus* taken on different occasions show that it is difficult to obtain true and consistent values. WHARTON (p. 137) shows that all Malayan anophelines prefer cattle, but *A. maculatus* bites man more readily than other species; it is, however, a relatively inefficient vector.

FOOTE (p. 762) has published a pictorial key to the mosquitoes of French Indo-China.

In JAVA VAN THIEL (p. 672) has made observations on wing length, size of ovarian ampullae and stage of development of eggs in an attempt to determine the age of female anophelines.

BONNE-WEPSTER and SWELLENGREBEL (p. 249) have produced a volume on the anophelines of the Indo-Australian region, intending it to be used by medical men who are compelled to be malariologists in remote places.

COOK (p. 1220) has issued illustrated keys to the mosquitoes of medical importance of the Philippine Islands, where the important vector of malaria is *A. minimus flavirostris*. The status of *A. mangyanus* is in doubt but *A. filipinae* may be a vector.

JONES (p. 529) has used measurements of the "collar", formed round the posterior end of the head by the posterior rim of the epicranial plate, as a useful index of age of larvae of *A. quadrimaculatus*. KARTMAN (p. 344) has tested 3 strains of *A. quadrimaculatus*, finding them equally susceptible to the St. Elizabeth strain of *P. vivax*.

In a discussion of the distribution of *A. albimanus* in the Caribbean islands, CHARLES and SENEVET (p. 529) make the point that many early records are unreliable owing to confusion between *A. albimanus* and *A. aquasalis*. ROZEBOOM (p. 529) confirms that *A. albimanus* was to be found in Barbados at the time of the malaria epidemic of 1927, though it is now absent from the island.

SENIOR WHITE (p. 6) studied the biting activity of *A. aquasalis*, *A. albimanus* and *A. neomaculipalpus* in Trinidad.

VAN DER KUYP (p. 119) gives a list of the mosquitoes of Curaçao, including one anopheline, *A. punctipennis punctipennis*.

GUEDES *et al.* (p. 530) show that there are 27 species of *Anopheles* in Brazil. *A. darlingi* is the most important vector, favouring shaded sites in ponds, lakes and calm rivers. This mosquito is common in houses but is also found resting on the outside walls. Physical and chemical data on the water of breeding places of *A. darlingi*, the only vector of malaria in part of southern Brazil, are given by RACHOU *et al.* (p. 6). In part of Brazil DEANE *et al.* (p. 1034) note that *A. darlingi*, though it prefers to bite near the ground, may feed as high as 15 metres above ground level. They give information on various other genera of mosquitoes.

DE ANDRADE (p. 251) reports observations on the relations between *A. aquasalis* and plankton in ditches in Brazil.

Bromeliad epiphytes are, with one exception, confined to the New World; their broad leaves hold water in which malaria-carrying anophelines of the sub-genus *Kerteszia* breed. SMITH (p. 250) shows that in Brazil towns are protected by deforestation of adjacent wooded slopes where bromeliads are normally prevalent, but that where this is not possible DDT is used in houses, and copper sulphate is used as a herbicide to destroy the plants. ARAGÃO *et al.* (p. 251) use a radio-active method for marking mosquitoes, and in this way have found that *Anopheles* (*Kerteszia*) spp. may travel at least 800 metres from the point of release.

RAMÍREZ AGUILAR (p. 1142) gives an account of the predominant anophelines of eastern Ecuador.

Aetiology

GARNHAM *et al.* (p. 668) for the first time have been able to demonstrate pre-erythrocytic schizonts of *P. ovale* in liver tissue.

BRUMPT and VŨ-CÔNG-HÒE (p. 1216) define a gamont, which is a parasite destined to give rise to a gametocyte, and they recognize gamonts of *P. falciparum*, which they describe.

SAUTET (p. 343) believes that spontaneous regression of malaria may be related to loss of ability of the parasite to form gametocytes, illustrating his view by showing that in Guadeloupe the percentage of gametocyte carriers in relation to total parasite carriers is high where malaria is intense and low where it is rare.

Pathology: Immunity

SHERWOOD JONES and MCGREGOR (p. 762) report on oxyhaemoglobin dissociation curves in African children with *P. falciparum* malaria. There is a tendency for these to show a shift to the right as a result of a fall in pH and fixed base.

McMAHON *et al.* (p. 673) and LOOMIS *et al.* (p. 878) discuss the liver abnormalities, which they describe as hepatitis, observed in a group of men with *P. vivax* malaria contracted in Korea. The mechanism of liver damage could not be ascertained.

ALLISON (pp. 526, 1143) recognizes a relationship between *P. falciparum* infection and the sickle-cell trait in that persons with the trait are less susceptible than others to the infection. The incidence of the trait in East Africa is said to follow closely the degree of endemicity of malaria, and the author supports his views with figures. The mechanism involved is obscure, but is possibly connected with the metabolism of haemoglobin by the parasite [but in comment Garnham suggests that it starts earlier, at the pre-erythrocytic tissue phase]. In a comment on the second paper Lehmann refers to the anthropological background of the sickling phenomenon. On the other hand MOORE *et al.* (p. 1221) on the coast of Kenya could find no difference in the malaria rate between two tribes, one with a sickle-cell-trait incidence of 10 per cent. and the other with 34 per cent.; there was no clear-cut relationship between splenic enlargement and sickling.

AUBRY and PORTIER (p. 673) have written an extensive paper on the pathogenesis of malaria, which should be read in full.

THONNARD-NEUMANN (p. 667) shows that *P. vivax* tends to invade reticulocytes relatively much more than older red cells. The third week of infection usually sees the first evidence of acquired resistance, including specific phagocytosis, but reticulocytes are less easily ingested than older cells, and the parasites which have invaded them have a better chance of surviving than parasites in the older cells. BRUMPT and HO-THI-SANG (p. 138) have studied the phagocytosis of pigment in malaria, pointing out that soon after the end of the pre-erythrocytic stage the circulating polymorphonuclears ingest entire parasitized erythrocytes, especially those which have lost all their haemoglobin and contain fully segmented schizonts. This activity accounts for the fact that at the end of the first week the degree of parasitaemia is much lower than the theoretical figure. Later, when febrile paroxysms and splenomegaly occur, phagocytosis is taken over by the wandering and fixed macrophages.

GARNHAM (p. 878) discusses malaria in the African child, quoting his recent finding that numerous malaria parasites (*P. falciparum* and some *P. malariae*) were present in 110 of 133 children examined in Uganda, none of whom was in any way ill. The nature of this immunity is not yet understood. In a discussion of immunity in malaria, GALLAIS *et al.* (p. 1142) make the point that in Indo-China the immunity is usually only operative against local strains, but that in Africa the immunity is much more solid. Malaria was never observed in African troops serving in Indo-China, and two African patients requiring malaria therapy were completely refractory to very large doses of *P. vivax* and *P. falciparum*.

HENRY (p. 7) points out that when the state of premunition begins to wane, symptoms of malaria may arise, and damage to the internal organs due to tissue anoxia may occur. He outlines a course of treatment for use in such cases.

Clinical Findings

COVELL (p. 1217) makes the point that strains of *P. vivax* in which renewed activity tends to occur 8–10 weeks and 30–40 weeks after the primary attack, and incubation is commonly protracted, are found throughout the world except in the south-west Pacific. The only strain in which protracted incubation and late relapse are unknown is the Chesson strain from New Guinea.

MACFARLANE and HUSAIN (p. 458) comment on 102 cases of *P. vivax* malaria in a military hospital in England; in 69 the attacks were suppressed primary attacks appearing at an average of 6 months after the patients had left Korea, or $2\frac{1}{2}$ months after they had left Malaya. Suppressive proguanil was discontinued on the voyage home.

A patient with urticaria and asthma, and *P. vivax* infection, is described by JASWANT SINGH and RAY (p. 459), who discuss the relationship of these conditions.

From a study of a Panama strain of *P. falciparum* in patients undergoing malaria therapy, JEFFERY and EYLES (p. 762) conclude that the average period of the untreated or inadequately treated infection is 279 days, with a range from 114 to 503, and that this strain is rather more virulent than a South Carolina strain, similarly studied.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control; Animal malaria—monkeys, other animals, birds.

MONTILLIER, J. Un foyer de paludisme au Gourara: Heiha. [**A Malaria Centre in the Gourara: Heiha**] *Arch. Inst. Pasteur d'Algérie*. 1954, Sept., v. 32, No. 3, 255–65, 1 text fig. & 4 figs. on 2 pls.

In 1953 REBOUL published a comprehensive survey of the Gourara in the Algerian Sahara, which included a summary of disease prevalence therein [this *Bulletin*, 1954, v. 51, 441]. The oasis Heiha was not included in his survey of malaria endemicity in the Gourara, apparently because of its relative inaccessibility. This deficiency Reboul's successor in Timimoun makes good.

Heiha lies some 60 kilometres north-west of Timimoun, on the edge of, but not within, the shifting sand dunes of the Erg. The rough track from Timimoun to Heiha, only just possible for motor traffic, has only recently been marked out.

The palm groves of Heiha encircle two inhabited *ksour* (fortified places) and a third *ksar* in ruins. The total population is 313, 108 Arabs, 200 Negroids and a single family of 5 Zenetes. There are some 250 wells, the water in which is from 5 to 15 metres from the surface. The water is raised by means of timber bascules with stone counterpoises and discharged into narrow T-shaped channels (*madjen*). The chief agricultural product is the palm date, of which there are numerous varieties. Wheat, barley and the usual vegetables of oases are also grown. There are a few fig trees. There are some camels, 6 asses and 160 sheep.

Up to 1951 medical visits to Heiha were not more frequently made than once a year: since then a doctor has visited the place at least every second month except in the hot season.

As long ago as 1913 FOLEY and MESLIN [this *Bulletin*, 1926, v. 23, 201] had found Heiha to be the most malarious of Gourara *ksour*: of the 52 children examined 19 per cent. (10) had enlarged spleens and 44 per cent. (23) harboured malaria parasites. In 1953 the author carried out a survey of which the results are set out in this paper. The spleen rate of 162 children examined was 12.9 and the parasite rate 54.9 per cent. *P. malariae* infections were most numerous, closely followed by *P. falciparum*. *P. vivax* was less in evidence. The Negroid element in the population shows a much greater tolerance of malaria infection than does the white Arab. The parasite rate of the Negroids was much higher than that of the white race but their spleen rates were much lower.

Mosquito larvae found in a *madjen* were identified as *Anopheles sergenti* and *Theobaldia longiareolata*. Wells and *madjen* are the only possible breeding places for mosquitoes: no larvae have been found in wells. Since 1953 the *madjen* have been kept in order and regularly cleaned. In that and in the following year the wells and *madjen* were treated with DDT. *Gambusia* have been introduced into the wells. As a result of all these measures the mosquito nuisance has abated. Since 1952 the children have received prophylactic doses of nivaquine [chloroquine sulphate] twice each month.

Norman White

TRINIDAD GOVT. **Annual Report of the Malaria Division, Health Dept., Trinidad & Tobago, 1953.** 47 mimeographed pp., 5 graphs (3 coloured). [1954.] Port of Spain.

There has been no epidemic of malaria in any part of the colony of Trinidad and Tobago during 1953; the number of deaths annually continues to fall and in this year the low figure of 74 is recorded. The malarialogist believes this to be undoubtedly too high because the critical density figure for *Anopheles aquasalis* and the spleen and parasite rates from schools throughout the colony do not lend any support whatsoever to this figure; he believes that many of the deaths recorded as malaria are due to other tropical febrile conditions which have escaped accurate diagnosis. In school surveys in Trinidad 2,526 children, and in Tobago 2,853 children, were examined and the numbers of enlarged spleens are quoted as 33 and 7, respectively, or 7.6 per cent. [should be 1.3] and 0.25 per cent.

The slide diagnostic service which provides a speedy and accurate diagnosis of malaria for medical practitioners produced 400 positive results in 3,492 examined or 11.45 per cent.; *Plasmodium falciparum*, 247 (61.75

per cent.); *P. vivax*, 147 (36.75 per cent.); *P. malariae*, 5 (1.25 per cent.); and mixed infections 1 (0.25 per cent.). The highest percentages of positive slides were in June and October and the lowest in March to May. There has been a significant change in the ratio of *P. falciparum* infections to *P. vivax* infections: the proportions in 1952 of 80.7/18.2 have changed to 61.75/36.5. The percentage of positive slides also showed a considerable decrease from 19.4 per cent. in 1952 to 11.45 per cent. in 1953.

At several treatment centres in various schools in North Trinidad, it is gratifying to see the maintenance of a decline in the number of children requiring treatment since the institution of these centres in places where malaria was very common several years ago; the drugs used are proguanil and mepacrine.

The entomologist's report deals with research work on the 3 anophelines common in Trinidad, namely *A. aquasalis*, *A. albicans* and *A. neomaculipalpus*. It does not lend itself to abstracting as each item is in the form of a progress report continuing on the annual report for the previous year. One or two features may be referred to here. Observations are being maintained on the population of *A. aquasalis* in relation to malaria control measures in order to determine the critical density below which the effective transmission of malaria will cease.

In the rice fields of the agricultural department at Curepe a considerable outbreak of *A. aquasalis* breeding occurred in July; in August these rice fields were converted into fish ponds and, in spite of the presence of larva-eating *Tilapia* there was considerable breeding for the rest of the year, but it did not proceed to the pupal stage; the effect of *Tilapia* on pupae merits further study.

The observations on the survival of *A. aquasalis* on damp ground have led to the conclusion that (a) egg hatching cannot be delayed longer than 48 hours and (b) newly hatched larvae, in many cases only partially emerged, are able to scrape microscopic growths from the mud but practically never survive longer than 14 days, i.e., half a lunar cycle. This must surely greatly restrict breeding in coastal mangroves if the phenomenon is general.

The volume of laboratory work is indicated by the following figures: adult identifications 224,166, larval identifications 13,053, specimens tubed for oviposition 58,593, and a very considerable quantity of dissections. [It is with great regret that the death is noted of R. A. SENIOR-WHITE, who has been the entomologist in charge of research work in Trinidad since 1948; his name is well known to all malariologists and entomologists, principally in connexion with his field research in India.]

The malaria division of the health department executes extensive control measures of a temporary nature in several areas of the colony. There does not yet exist in the framework of the health department a sanitary engineering unit and until that time comes, capital works must of necessity be often of indifferent value in the case of malaria control. The spraying of bromeliads with copper sulphate solution for the control of *Anopheles bellator* was continued in the cocoa-bearing and forest areas.

The policy of carrying out residual spraying in coastal and malarious areas was expanded during the year 1953 and a programme to include most of the houses in the colony was attempted. In Port of Spain over 11,000 houses were sprayed, protecting a population of about 100,000 people; in the country districts about 100,000 houses were treated and 500,000 persons protected.

In Tobago, the original 5-year plan jointly supported by the funds from the Government of Trinidad and Tobago and the Rockefeller Foundation

came to an end. The eradication work was continued during the year 1953 from government funds only and executed along similar lines to the work of past years. The fall in malaria rates was maintained and the success of this programme may be realized from the examination of schoolchildren in the island, the relatively low densities of mosquitoes and the very small number of positive blood smears obtained. As in Trinidad, weather conditions in Tobago were wetter in 1953 than in 1952. Only one spraying with residual insecticide was carried out in 1953 as against 2 in previous years. Of 2,322 slides examined, only 12 were positive for malaria, 6 of *P. falciparum*, 5 of *P. vivax* and 1 of *P. malariae*. Included in these were 930 slides taken at the time of school examinations and for the first time since 1943 there was no positive slide. Spleen rates in some 30 Tobago schools were nil in 24 instances and in the remainder were about 1 per cent.; these results contrast strongly with those obtained in the original survey in 1941 when in half the schools the spleen rate exceeded 20 per cent. The Rockefeller Foundation continued to be interested in the scheme in giving advice and general support to the programme.

Several special investigations were carried out throughout the year. Most important of these were investigations into the bionomics of the mosquitoes of the *Kerteszia* group and the careful study of the possibility of resistance to insecticides of some of the Trinidad mosquitoes. Preliminary studies with regard to special ecological problems of *A. albitarsis* and *A. neomaculipalpus* were also undertaken. [For 1952 Report, see this *Bulletin*, 1954, v. 51, 134.]

R. Ford Tredre

SHUTE, P. G. & MARYON, M. **A Contribution to the Problem of Strains of Human *Plasmodium*.** *Riv. di Malariologia*. 1954, June, v. 33, Nos. 1/3, 1-21. [16 refs.]

As in some other pathogenic protozoa, among the human malaria parasites there exist intraspecific strains, which are indistinguishable morphologically but differ in various biological characters, such as immunity, response to drugs, vector-specificity, etc.

The occurrence and behaviour of such strains are discussed by the authors on the basis of the vast experience gained in the course of the last 30 years at Horton Hospital, Epsom, where all the 4 species of human *Plasmodium* have been used for malaria therapy in a total of 13,000 patients. When biological differences were present, they were exhibited by strains originating from distinct geographical areas, but not within the same locality, since in the latter cross-fertilization would tend to eliminate the differences, with the result that indigenous races are represented by a single strain.

P. vivax malaria was represented by strains from Madagascar (*M*), Rumania (*R*) and French Cameroons (*FC*). While in infections with *M* strain the incubation period was short (average 12 days), in the case of the other two it was protracted. Both *M* and *R* strains responded to treatment with quinine and mepacrine, and about half produced relapses about 38 weeks later. After recovery, patients infected with *M* strain acquired immunity against the homologous strain, but such patients were slightly susceptible to infection with *FC* strain. All the *P. vivax* strains infected English *Anopheles maculipennis atroparvus*, but the number of oöcysts developing on the stomach was scanty (<100) in the case of *M*, and high (up to 1,000) in *R*.

The *P. falciparum* strains originated from India, West Africa (*WA*), East Africa, the Belgian Congo, Italy (*It.*) and Rumania (*R*). The European strains showed similar properties, though the Rumanian was not so virulent

as the Italian one, but both produced more severe infections than the African strains. Their response to quinine was also different, for the dose of quinine required to abort an attack of fever with *It.* was 8 times greater than in the case of *WA.* Likewise, there was a difference in the infectivity to *A. m. atroparvus*, which was susceptible to the European strains but refractory to the African and Indian strains. On the other hand, the Indian mosquito, *A. stephensi*, could be readily infected with gametocytes of both *WA* and *R* strains.

P. ovale was represented by a number of samples from West and Central Africa. Since their behaviour in the human and insect hosts was similar, it would seem that this species is represented by a single strain. Samples of *P. malariae* from West Africa and from Latin America also showed no biological differences, therefore there is no evidence that more than one strain was represented.

Finally, the significance of morphological distinctions described by some authors in parasites belonging to different strains of *P. falciparum* is considered, and it is pointed out that variation in the size of the ring forms depends upon the stage of the disease in the same patient, for they become larger as the infection progresses from the acute to the chronic phase.

C. A. Hoare

BHOMBRE, S. R., SITARAMAN, N. L. & BROOKE WORTH, C. **Seasonal Prevalence of Anophelines in Western Hill Tracts of Mysore State.** *Indian J. Malariology.* 1954, Mar., v. 8, No. 1, 47-62, 3 charts.

This paper is the result of an anopheline survey of the Western Hill Tracts of Mysore State, India. Most of the observations have already been set forth in a previous publication [this *Bulletin*, 1954, v. 51, 671]. Three areas were selected for study on the intensity of the rainfall. Notes are given of the seasonal prevalence of adults and larvae of 23 species collected from these areas.

A study of the seasonal prevalence of *Anopheles fluviatilis*, the alleged vector, showed that in the high and intermediate rainfall areas it virtually disappeared during heavy rains, reappearing later in the year. This phenomenon was recorded by SWEET and RAO also [*Records of the Malaria Survey of India*, 1933, v. 3, 663]. It may be due to the flushing out of the larval habitats during heavy floods caused by the monsoon rains. Where such flooding is less extensive as in the low rainfall area, the species was present in the monsoon period though in small numbers.

In their discussion, the authors point out that if the preferred larval and adult habitats are absent, a species cannot become abundant however favourable other conditions may be. In many cases the limiting factors of species distribution may apply to adults and this in turn may influence the choice of larval habitats. Thus, in the course of the survey it was found that *A. jeyporiensis* was abundant in the high rainfall area but diminished in numbers with decreasing rainfall and consequent humidity. The reverse was true of *A. pallidus* which was able to survive in hot dry areas but showed poor adaptation to areas of high rainfall and humidity where the required larval habitats would be scarce. Climate (temperature and humidity) influences the longevity of the mosquitoes and this in turn determines the status of an anopheline as a malaria vector. Although the rainfall may influence larval and adult abundance, there may be other local factors responsible for this.

Larval collections may not always give a reliable index of the numbers of adult mosquitoes prevalent in an area. A high larva-adult ratio may

point to a shortened life of the adults. It may also indicate a low rate of day-time resting indoors as in the case of *A. barbirostris*. Shortened adult longevity may be significant in the case of vector species, as it shows that the mosquito after a blood meal is unable to survive the extrinsic incubation period of the plasmodia. A low larva-adult ratio will, on the other hand, indicate an enhanced longevity of the mosquitoes. This explains why several adults can sometimes be captured when the larval population is low.

M. G. R. Varma

ARNOLD, J., ALVING, A. S., HOCKWALD, R. S., CLAYMAN, C. B., DERN, R. J. & BEUTLER, E. **Natural History of Korean *vivax* Malaria after Deliberate Inoculation of Human Volunteers.** *J. Lab. & Clin. Med.* 1954, Nov., v. 44, No. 5, 723-6, 1 fig.

The pattern of clinical activity exhibited by naturally acquired Korean *P. vivax* malaria has been described by HANKEY and his colleagues [this *Bulletin*, 1954, v. 51, 460]. The purpose of the present study was to make observations on the course of the disease over an extended period under controlled conditions, where the date and intensity of infection were known and where reinfection was impossible.

Six male white volunteers, inmates of the Stateville Penitentiary, Joliet, Illinois, were infected with a Korean strain of *P. vivax*, each being subjected to the bites of 10 mosquitoes. Four of the men developed overt malarial attacks within the usual incubation period, the primary attack in the remaining two being delayed for 287 and 315 days, respectively [see also BRUNETTI, this *Bulletin*, 1954, v. 51, 454]. Of the four who experienced an early primary attack, one was discharged 4 months after infection and his subsequent history is unknown. The other 3 experienced a series of long term relapses commencing 273, 279 and 313 days, respectively, after infection. Each overt attack was treated promptly and vigorously with a schizonticidal drug.

It was concluded that the season of the year had little direct effect on the relapse pattern, that the occurrence of an early or late primary attack is not dependent on the intensity of infection and that the disease terminates spontaneously about 18 months after infection.

[The authors note the similarity of the clinical pattern of Korean *P. vivax* malaria to that of "other temperate zone malarias". It should be noted, however, that the characteristics described are by no means confined to the malaria of temperate zones, since they have also been observed in strains encountered in many parts of the tropics (this *Bulletin*, 1954, v. 51, 1217).]

G. Covell

HOEKENGA, M. T. **The Treatment of Acute Malaria with Single Oral Doses of Amodiaquin, Chloroquine, Hydroxychloroquine and Pyrimethamine.** *Amer. J. Trop. Med. & Hyg.* 1954, Sept., v. 3, No. 5, 833-8. [10 refs.]

The observations recorded in this paper were made at the United Fruit Company's Hospital in La Lima, Honduras. The patients treated were of mixed Indian, Negro and Spanish ancestry and were considered to have acquired partial immunity. All were suffering from acute attacks of malaria at the time of treatment. Out of 1,020 patients treated, 477 had *P. falciparum* and 543 *P. vivax* infections.

Chloroquine was given to 320 patients in 2 single-dose schedules: 0.45 gm. or 0.6 gm. of base. Amodiaquine (Camoquin) was given to 500

patients in 4 single-dose schedules: 0.4 gm., 0.6 gm., 0.8 or 1.0 gm. of base. Hydroxychloroquine (Plaquenil) was given to 125 patients in a single dose of 1.25 gm. Pyrimethamine (Daraprim) was given in a single dose of 50 mgm. to 18 patients and of 100 mgm. to 57 patients.

The clinical response was satisfactory with all the 3 4-aminoquinolines, symptoms disappearing within 36 to 48 hours. The response to pyrimethamine was less rapid and convalescence was prolonged by 1 to 3 days. Temperatures returned to normal earlier in patients with *P. falciparum* malaria receiving 1.0 gm. of amodiaquine base than with those given smaller amounts of this drug; this was not noted in patients with *P. vivax* malaria. The 0.45 gm. dose of chloroquine did not prove entirely satisfactory in respect of temperature response. Of the 320 patients treated with chloroquine, 10 did not respond (1 from the 0.6 gm. group, 9 from the 0.45 gm. group). Of the 500 patients treated with amodiaquine, 3 did not respond. These were all in the 0.4 gm. group. Of the 125 patients treated with hydroxychloroquine, 2 were classed as failures. Of the 75 patients treated with pyrimethamine, 6 were classed as failures (3 in each group). No serious toxic effects were noted in any of the patients treated. No evaluation of the incidence of radical cures effected by the various drugs was attempted. As the author justly remarks, such an evaluation is never satisfactory in an endemic malaria area, because immunity cannot be measured or re-infection controlled.

It is concluded that in this area it is practical to treat most malaria patients on an ambulant basis with a single dose by mouth of either amodiaquine, chloroquine or hydroxychloroquine; single-dose treatment with pyrimethamine is less satisfactory.

G. Covell

JASWANT SINGH, RAY, A. P., MISRA, B. G. & NAIR, C. P., in collaboration with RAJINDAR PAL, M. I. D. SHARMA, B. S. KRISHNAMURTHY, M. K. MENON & DALIP SINGH. **Antirelapse Treatment with Primaquine and Pyrimethamine.** *Indian J. Malariology*. 1954, June, v. 8, No. 2, 127-36. [14 refs.]

The object of the work here recorded was to test the effect of (a) primaquine and (b) quinine-pyrimethamine on the relapse rate in *P. vivax* malaria.

In September 1953 blood smears were taken in a group of 6 villages in India in which the spleen rates were respectively 74, 64, 34, 33, 24 and 17 per cent. All the villages were sprayed with residual insecticide immediately before treatment was begun in order to intercept transmission by mosquitoes, and a further spraying programme was arranged for the following March.

The authors treated 107 persons (102 *P. vivax*, 2 *P. vivax* and *malariae*, 3 *P. malariae*) under one of two regimens. Regimen I consisted of 7.5 mgm. of primaquine base twice daily for 5 days; Regimen II of two tablets each containing 5 mgm. of pyrimethamine and 0.3 gm. of quinine dihydrochloride every 12 hours up to 3 such doses, followed by a weekly dose of 25 mgm. of pyrimethamine for 8 weeks.

Fifty other persons, members of the Delhi Police Force or inmates of the gaol, were also placed under Regimen II.

In all, 50 persons, of whom 46 were followed up for 6 to 7½ months, were treated under Regimen I, and 126, of whom 100 were followed up, were treated under Regimen II.

None of the patients under primaquine relapsed during the period of

observation, whereas 6 per cent. of those under quinine-pyrimethamine relapsed during the same period. The initial response to treatment, as determined by parasite clearance, was slightly better under quinine-pyrimethamine treatment. The reverse was the case in respect of gametocytes. No toxic manifestations were observed in either group.

The authors conclude that treatment with primaquine is the more advantageous, particularly because it is less complicated and is completed more quickly. They recommend its use in areas where mosquito control measures are operative and where a reduction in the transmission rate is of special importance.

G. Covell

CLYDE, D. F. & SHUTE, G. T. **Resistance of East African Varieties of *Plasmodium falciparum* to Pyrimethamine.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Nov., v. 48, No. 6, 495-500. [13 refs.]

The observations here recorded were made in a group of villages situated 30 miles inland from the coast of Tanganyika, where malaria is described as holoendemic. It is estimated that transmission in this area remains at a constant level of one potentially infective bite per person on each night throughout the year. The predominant parasite is *Plasmodium falciparum*. A preliminary account of the work was given by the senior author in a previous paper [this *Bulletin*, 1954, v. 51, 678]. Its primary object was to evaluate the prophylactic properties of pyrimethamine (Daraprim).

In one village a single monthly oral dose of 100 mgm. of pyrimethamine was given to persons aged more than 10 years, 50 mgm. to children of 5 to 10 years and 25 mgm. to those under 5 years of age. The criterion of resistance was the persistence of asexual parasites in the peripheral blood for 5 or more days following drug administration.

The inhabitants of two neighbouring villages were used for comparison purposes. At 5, 9 and 14 days following the administration of a single dose of pyrimethamine to 140 inhabitants of these two villages the asexual parasite rate was nil. On the 21st day the rate was 14.2 per cent. It was concluded that all parasites making up the initial rates were sensitive to a single dose of the drug.

In the experimental village monthly pyrimethamine prophylaxis was begun in June 1953 and was continued for 6 months. The asexual *P. falciparum* parasite rates taken monthly on the day of drug administration are given below:

Ages	Number examined	Parasite rates per cent.						
		Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
0-4	40	75	35	36	38	46	73	80
5-10	30	74	33	20	35	47	47	78
11-20	15	75	18	27	36	30	40	40
21+	45	46	6	7	9	10	27	22
TOTAL	130	64.3	22.6	20.9	28.2	31.7	46.8	58.1

(The last date of drug administration was in November 1953.)

It was assumed that since the period of aparasitaemia effected by a single dose of pyrimethamine is approximately 14 days, the rates of about 20 per cent. observed in July and August represented fresh infections with pyrimethamine-sensitive parasites which had had some 10 days in which to develop in the blood; the subsequent rise in the monthly rate over 20 per

cent. was taken to represent the emergence and spread of parasites resistant to the action of pyrimethamine. Thus the percentage of resistant parasites was nil in July and August, 8 in September, 12 in October, 27 in November and 38 in December.

The existence of resistant parasites was confirmed by giving a single dose of pyrimethamine to 19 children in the experimental village who had been under monthly pyrimethamine prophylaxis for 6 months. Parasites were demonstrated in the peripheral blood of all these children 9 days later, when a second dose of the drug was given. Four days afterwards parasites were still present in all cases. Each child then received a dose of amodiaquine, and a week later none showed parasitaemia.

Ten weeks after the last administration of pyrimethamine in the experimental village, blood examinations were made in this and in the two comparison villages. In the former the total parasite rate was 48.4 per cent. and the insusceptible parasite rate 29 per cent.; in the latter the total rate was 54.4 per cent. and the insusceptible parasite rate nil. It was concluded from these findings that the resistant parasites were in process of submergence through the recurrence of susceptible parasites.

It is suggested that resistant strains of *P. falciparum* may be induced in East Africa by single doses of pyrimethamine administered at intervals greater than 14 days; that resistance is acquired at a point in the excretion of pyrimethamine when the small quantity of the drug remaining in the tissues fails to destroy the parasite; and that resistance represents an ability on the part of the parasite to compete favourably with pyrimethamine for essential nutrient tissue chemicals.

G. Covell

BHOMBORE, S. R., SITARAMAN, N. L. & NANJUNDIAH, K. S. **Wing Grade Composition as an Index for judging the Effectiveness of Residual Toxicity of Insecticide Deposits.** *Indian J. Malariology*. 1954, June, v. 8, No. 2, 147-53, 2 charts (1 folding).

One way in which residual insecticides may reduce malaria is by curtailing the survival of mosquitoes to less than the time necessary for reinfesting another man. This should be reflected in a younger average age of the mosquito population in an effectively sprayed village; this average age would probably rise as the insecticide residues gradually became ineffective.

This possible check on DDT treatments was investigated in 4 villages in Mysore; two were sprayed, except for a few houses, and two were left unsprayed. No mosquitoes were subsequently caught in the sprayed houses, but considerable numbers were taken from the untreated houses in the sprayed village, and these were examined in comparison with specimens from the unsprayed village. The ages of the mosquitoes were assessed by wing fraying, giving four stages of aging (as suggested by PERRY [this *Bulletin*, 1912-13, v. 1, 115]). Six comparisons are shown for different times of the year and at intervals of 7 to 189 days after DDT spraying. The data are also given in another way to provide an overall figure of population age from the numbers present in the 4 stages. (The numbers in stage I are added to twice the number in stage II, 3 times the number in III and 4 times that in IV; the whole being then divided by the total number of specimens.)

Unfortunately neither method of treating the data shows a distinct difference between specimens from the DDT-treated villages and the comparison villages. In both of them the figures were lower in December and

January (when breeding was prolific) than in February and March (when breeding was much reduced). *J. R. Busvine*

CORRADETTI, A. & VEROLINI, F. Relazioni patologico-immunitarie tra parassita e ospite in *Macacus rhesus* inoculati con sangue infetto da *Plasmodium cynomolgi*, successivamente splenectomizzati, e ripetutamente reinfettati con ceppo omologo. [**Host-Parasite Relations in Macaques infected with *Plasmodium cynomolgi*, then splenectomized and re-infected with Homologous Strain**] *Riv. di Parassit.* Rome. 1954, Apr., v. 15, No. 2, 65-79. English summary.

The authors have previously shown that *Plasmodium cynomolgi*, when passaged through *Macacus rhesus* by blood inoculation, was capable of producing relapses in the absence of exo-erythrocytic stages in the liver [this *Bulletin*, 1951, v. 48, 437]. In the present paper they describe observations on 10 monkeys with blood-induced serial infections, the object of which was (a) to determine the minimum and maximum duration of the infection, (b) to ascertain the results of re-infection with the homologous strain both in splenectomized and non-splenectomized animals, and (c) to search for EE forms in the course of the infection. Of these monkeys, 8 were splenectomized at different intervals after termination of the primary attack, and 2 were not splenectomized. All the animals were challenged, at different intervals and various numbers of times, with the homologous strain, and the liver of some of them was examined after biopsy for the presence of EE forms.

The observations on each of the experimental animals are described in detail and the results are given in 3 tables. The duration of the infection—determined by regular blood examination of splenectomized and non-splenectomized monkeys, as well as by subinoculation into normal animals—varied from about 174 to 703 days after inoculation. Those splenectomized monkeys which did not relapse, i.e., had completely recovered from the infection, could be successfully re-infected with the same strain of *P. cynomolgi*. The resulting infection either persisted—with parasitaemia—for the rest of the host's life, or it lasted for a short time, terminating in recovery. In the latter case, the host could be repeatedly re-infected, but the severity and duration of the succeeding infections declined progressively. Since EE forms could not be detected in liver biopsies made at different periods of the infection and under various conditions of immunity, it is concluded that, in the case of blood-induced infections, the relapses originate from the erythrocytic forms of the parasite. Although during the latent periods of the infection parasitaemia is undetectable microscopically, the parasites multiply rapidly whenever the defence powers of the host are spontaneously or artificially reduced.

In discussing the bearing of their findings on other mammalian malarias, the authors suggest that the exo-erythrocytic cycle of the human parasites in the liver is typically restricted to the incubation period and to the primary attack, and that consequently relapses may be produced in the same manner as described in the present paper for *P. cynomolgi*. *C. A. Hoare*

DUTTA, B. N., DAS GUPTA, N. N., DE, M. L., GUHA, A. & NANDI, S. **New Method for Study of Intracellular Parasites with the Electron Microscope.** *Science*. 1954, Sept. 10, v. 120, 428-30, 7 figs.

This paper describes a simple method for studying malaria parasites by electron microscopy. Blood infected with *Plasmodium berghei* is smeared

on a glass slide coated with collodion, and is fixed by exposure to osmic acid vapour for 3 minutes. Hydrolysis in normal hydrochloric acid at 60°C. is conducted for 10 minutes, and after drying, the collodion film with the hydrolysed blood smear is stripped from the slide and mounted on steel mesh for examination under the electron microscope. [A description of the parasites is given, accompanied by good photomicrographs, but nothing seems to have been demonstrated which is not discernible by ordinary methods, and it is perhaps doubtful how much of value could be revealed by a method which involves drying and possibly not even wet fixation; measurements of size are surely much more accurately obtainable by the older methods. The advantage of this technique is that hydrolysis reduces the masking effect of the erythrocyte, and allows the parasite to become visible.]

P. C. C. Garnham

FABIANI, G. & ORFILA, J. Caractères généraux du paludisme expérimental de la souris blanche infectée par *Plasmodium berghei*. [**Characteristics of Experimental Murine Malaria produced by *Plasmodium berghei***] *Ann. Inst. Pasteur.* 1954, July, v. 87, No. 1, 38-45.

An account is given of the course of malaria in white mice infected with *Plasmodium berghei*, based on observations on 180 animals inoculated intraperitoneally with doses from 100,000 to 50,000,000 parasitized red cells. Some of the mice died in the course of the 1st week, in the absence of anaemia but with parasitaemia rising rapidly, while reticulocytosis of the blood diminished or disappeared and the parasites occurred in mature erythrocytes. If the mice did not die at this stage, the proportion of reticulocytes—which were the only host cells infected—rose, with the curve for parasitaemia running parallel with that of reticulocytosis, and death took place when anaemia was well marked. These two haematological pictures correspond to two distinct stages in the development of the same disease. It is emphasized that there is no evidence of acquired immunity in the course of the murine infection, and there are no means of predicting the course it will take. The latter is a handicap in the testing of anti-malarial compounds.

C. A. Hoare

ADLER, S. **The Behaviour of *Plasmodium berghei* in the Golden Hamster *Mesocricetus auratus* infected with Visceral Leishmaniasis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Sept., v. 48, No. 5, 431-40, 6 figs.

Thirty-six golden hamsters were infected with various strains of *Leishmania infantum* (including one strain from Yemen and another from Kenya, and provisionally given this specific name because of their close resemblance to Mediterranean strains which are refractory to antimonial drugs). When splenic biopsy indicated that the infection was established, the animals were inoculated intraperitoneally with 40 million *Plasmodium berghei*, and the resultant infections were studied. The malaria infection kills normal hamsters in an average of 17 days and mortality is almost 100 per cent. The animals infected with *Leishmania* responded in 4 ways—19 died of malaria but survived about 6 days longer than usual, one developed a heavy infection from which it recovered, 7 showed no patent infection, and 9 developed slight infections which were non-fatal. Animals

with such transient infections were found to be resistant to massive inocula of *P. berghei*; however, the blood of 2 out of 3 animals which had apparently recovered was found to be still infective to mice, indicating that the *P. berghei* had been suppressed but not eradicated by the co-existence of leishmaniasis.

It was first thought that the leishmanial infection might cause the malaria to fulminate by blocking the reticulo-endothelial system and inhibiting immunity, but the contrary happened—not only were the reticulo-endothelial cells still able to phagocytose malaria parasites, but a humoral factor was also shown to be in action, as indicated by the abnormal appearance of parasites within erythrocytes. They became highly distorted, vacuolated and fragmented, with deposition of pigment in large masses. This action was most marked in animals inoculated with virulent strains of *Leishmania* and in the last stages of the disease, when the flagellate is multiplying profusely and when the plasma shows marked changes in constitution. The development of *Babesia rodhaini* is also inhibited in hamsters infected with *Leishmania*.

[*P. berghei* is obviously highly sensitive to disturbances in its experimental hosts—to diet deficiencies (see MAEGRAITH *et al.*, this *Bulletin*, 1953, v. 50, 384), to presence of leukaemia (see NADEL *et al.*, *ibid.*, 1955, v. 52, 127), to hormone changes (see GALLIARD *et al.*, below, p. 254), to the “wrong” mosquito (see RODHAIN, *ibid.*, 128), etc.; now Adler shows that the presence of another protozoon can have an equally profound effect. It will be interesting to determine whether all these phenomena are the result of deficiency of one or more essential metabolites.] P. C. C. Garnham

RAFFAELE, G. & CARRESCIA, P. M. Sull'azione della dieta lattea nelle infezioni da “*Plasmodium berghei*” dei topi e sua influenza sull'immunità. [Effect of Milk Diet on Infection and Immunity in Mice infected with *Plasmodium berghei*] *Riv. di Malariologia*. 1954, June, v. 33, Nos. 1/3, 47–62, 6 charts. [26 refs.] English summary.

The authors report the results of experiments on the effect of a milk diet upon mice infected with a strain of *Plasmodium berghei* maintained at the Institute of Malariology in Rome. Observations on 169 infected mice in the course of the last 2 years showed that the mortality was 100 per cent., the infections lasting on the average 14.6 days (minimum 4, maximum 34 days).

In the present experiments, 22 mice were fed for various periods before inoculation with *P. berghei* on a diet of pasteurized milk supplemented with vitamins B1 (25 mgm./l) and B6 (10 mgm./l). Ten of these mice recovered spontaneously after infections lasting on the average 57.4 days, while one mouse, which received *p*-aminobenzoic acid, developed an acute infection terminating in death. Several of the recovered mice, whose blood was shown to be non-infective when subinoculated to other mice, were challenged by re-inoculation of *P. berghei*. They showed a certain—but variable—degree of immunity to re-infection. Since, as a rule, mice show no evidence of acquired immunity to infection with this parasite, it is concluded that, in the present cases, the development of immunity was favoured by a prolongation of the duration of the infection under the influence of the milk diet. [See also this *Bulletin*, 1954, v. 51, 772.]

C. A. Hoare

RAMAKRISHNAN, S. P. **Studies on *Plasmodium berghei* Vincke and Lips, 1948. XVI. Effect of Ketogenic Diet on the Course of Blood-Induced Infection in Rats.** *Indian J. Malariology*. 1954, June, v. 8, No. 2, 85-8. **XVII. Effect of Different Quantities of the Same Diet on the Course of Blood-Induced Infection in Rats.** *Ibid.*, 89-96. **XVIII. Effect of Diet Different in Quality but Adequate in Quantity on the Course of Blood-Induced Infection in Rats.** *Ibid.*, 97-105. **XIX. The Course of Blood-Induced Infection in Pyridoxine or Vitamin B₆ Deficient Rats.** *Ibid.*, 107-13. [17 refs.]

XVI. Earlier experiments on the course of *P. berghei* infection in starved rats have been described by the author [this *Bulletin*, 1954, v. 51, 144]. It was found in later experiments that addition of methionine to the diet of the starved animals caused a marked increase in parasitaemia. In the present investigation the part played by a ketogenic diet in the same infections has been studied. Five rats were given a high fat diet and 5 others a normal diet, starting one week prior to infection with *P. berghei*. On the former diet the animals lost weight owing to lower consumption of food and the course of parasitaemia was milder, being accompanied by smaller increase in spleen weights than in controls.

XVII. In this series of experiments the course of the infection was followed in rats receiving adequate and inadequate amounts of the same diet so that some were partially starved. In all, 92 animals were used and maintained on the selected diet for a considerable period prior to inoculation, the subsequent course of parasitaemia being followed. It appeared as in previous experiments that the under-nutrition of the host markedly affected the degree of primary parasitaemia and caused a decrease in the capacity for antigenic stimulation, relapses being relatively less common but more severe. The application of the findings in rats to famine conditions and the epidemiology of malaria in man are discussed.

XVIII. The effect of diets qualitatively different but adequate in quantity given to rats infected with *P. berghei* was next studied in 132 animals. These diets were classed as vegetarian, lacto-vegetarian and meat-containing. Some were given on account of their high calorific value alone. As before the animals were fed on them for 2 weeks or longer prior to inoculation. Results showed that vegetarian diets rich in carbohydrate in which rice or wheat was present, caused a more severe primary infection than occurred with a balanced diet. Mortality due to chronic infection was low and immunity high in animals on such a diet. A meat diet caused the most severe primary and chronic infections. The effect of including milk in the diet was to produce a milder infection.

XIX. The need of malaria parasites for vitamins has found expression in the literature since 1944 and a table summarizing these results is given in the present article, in which the effect of pyridoxine on the course of *P. berghei* infection in rats is described. Twelve rats were used, 6 being fed on pyridoxine-free diet, 3 on the same diet supplemented with this vitamin and 3 others on normal diet for 4 months before inoculation with plasmodia. It appeared from the results that pyridoxine was essential for growth of *P. berghei* since the average daily, as well as peak, values of parasitaemia were lowest in the deficient animals. J. D. Fulton

ROBERTS, O. Joy. **The Effect of Cortisone on *Plasmodium berghei* Infections.** *Parasitology*. 1954, Nov., v. 44, Nos. 3/4, 438-45, 6 figs.

Mice were infected with a recently isolated strain of *Plasmodium berghei*, and during the course of the subsequent infection sera from various sources

were inoculated in small quantities (*e.g.*, 0.1–0.2 ml.). The effect on parasitaemia was then studied in relation to control mice which had received no serum. Serum from normal mice produced no effect; serum from uninfected mice which had received cortisone for 5 days equally caused no decrease in the level of parasitaemia; serum from mice suffering from *P. berghei* malaria occasionally had a transient inhibitory action; on the other hand, serum from mice suffering from *P. berghei* malaria and treated with cortisone produced a very marked decrease in parasitaemia which persisted for several days. The administration of cortisone to an animal suffering from malaria thus appears to enhance the production of humoral antibodies.

P. C. C. Garnham

GALLIARD, H., LAPIERRE, J. & MURARD, J. Inhibition de l'infection à *Plasmodium berghei* chez la souris et le rat par l'hormone hypophysaire de croissance (S.T.H.). [**Inhibition of *P. berghei* Infection in Mice and Rats by Somatotrophic Hormone**] *Ann. Parasit. Humaine et Comparée*. 1954, v. 29, No. 3, 167–78, 5 figs.

Galliard has already shown [see this *Bulletin*, 1954, v. 51, 737] the inhibitory action of the somatotrophic hormone (STH) on *Plasmodium berghei* in mice, and on *Trypanosoma inopinatum* in frogs. This paper gives further information on the phenomenon, in male mice injected intraperitoneally on alternate days with 5 units (rat), and in rats with 8–10 units. The hormone normally causes a “monocytoid” [? polyblast] reaction in the blood during the second week; by the third week the number of erythrocytes is halved and eosinophiles doubled. If STH is given to mice at the same time as the parasite, the fatal issue is delayed by up to 5 days and parasitaemia is lessened as compared with controls; if the hormone is given before the infection, life is prolonged still more, even up to 29 days, all cases being accompanied by a low parasitaemia, with few visible schizonts. If the experimental mice were given a high protein diet (milk extract), the results were variable, though in one instance a mouse lived for 25 days and then died with a parasitaemia of 80–90 per cent. Mice on a high protein diet, but without STH, also survived longer than controls. These experiments were repeated on rats weighing not more than 50 grammes, with conflicting results.

Mice were given a preparatory treatment with STH and were then infected with *Toxoplasma*; death occurred after the same interval as in untreated controls; guineapigs, however, lived a week longer.

Trypanosoma brucei infections in rats and mice were totally unaffected by the administration of the hormone.

P. C. C. Garnham

DRAPER, C. C. **The Duration of Residual Immunity following Spontaneous Cure of *Plasmodium berghei* in Rats.** *Parasitology*. 1954, Nov., v. 44, Nos. 3/4, 338–41, 1 fig.

Thirteen rats (black and white hooded, and white), 3–4 months old at the beginning of the experiment, were kept for periods of 10–22 months after infection with *Plasmodium berghei*, spontaneous eradication of the malaria occurring on an average after 4 months. They were then re-inoculated with massive doses of heterologous, rather avirulent strains, and the presence of parasites was observed either by examining thick blood films or by subinoculating mice. The duration of parasitaemia was less influenced by the size of the inoculum than by the length of the period of recovery

from the original infection. Rats which had been infected 22 months earlier exhibited parasitaemia for at least 40 days, while those infected about a year earlier showed parasites in diminishing numbers for a few days only. Thus residual immunity after spontaneous cure begins to wane 15-18 months later, and even before that is not absolute. *P. C. C. Garnham*

LAPIERRE, J. *Plasmodium berghei* chez la souris. Apparition d'un état d'immunité à la suite de traitements répétés par la Nivaquine au cours des rechutes. [*Plasmodium berghei* Infections of Mice: Appearance of Immunity after Treatment of each Relapse with Nivaquine] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 3, 380-87, 1 fig. [10 refs.]

Forty mice were infected with *Plasmodium berghei*, and of these 13 exhibited relapses after treatment of the primary attack. Eight of the 13 died during the second or third relapse, and this paper presents observations on the remaining 5 animals which survived. One of the survivors had 4 relapses, each of which was treated by injections of nivaquine [chloroquine sulphate]; 200 days later it was re-inoculated with the same strain of parasite and it developed an infection, amounting on the seventh day to a 25 per cent. parasitaemia, when treatment caused the disappearance of the parasites but failed to prevent death 10 days afterwards. Another mouse had 3 relapses, the last of which cured itself without nivaquine but death ensued 14 days later. A third mouse also had 3 relapses; then 140 days later it was re-inoculated and by the eighth day parasitaemia reached 30 per cent.; treatment was followed by disappearance of parasites but the animals died 11 days later. The fourth mouse had a single relapse, and 30 days after cure it was re-inoculated but no parasites appeared in the blood, and when it died after 11 days (from an unknown cause) no parasites were demonstrated in the organs. The last mouse had 2 relapses; 20 days after the cure of the second it was re-infected, and after a latent period of 9 days a fatal parasitaemia occurred. Thus one mouse after re-infection exhibited a normal infection, two showed some degree of immunity (by delay of incubation period), another was refractory, while in one the infection cleared up of its own accord during the third relapse. *P. C. C. Garnham*

TRAGER, W. **Coenzyme A and the Malaria Parasite *Plasmodium lophurae*.** *J. Protozoology.* Utica. 1954, Nov., v. 1, No. 4, 231-7. [22 refs.]

In his studies on the extracellular cultivation of *P. lophurae* [this *Bulletin*, 1953, v. 50, 195] the author found that coenzyme A caused an increase in the life span of the parasite, and suggested that the latter was unable to synthesize this substance which may be supplied by the host red cell. The coenzyme A content of the tissues and red cells of normal birds and those infected with *P. lophurae* has now been determined and observations have been made on its destruction by haemolysates. The effect of the coenzyme was uninfluenced by the presence of free pantothenic acid which forms part of its molecule. Red cell extracts contained enzymes which slowly hydrolysed coenzyme A at 40°C. Chicken and duck red cells heavily parasitized with *P. lophurae* contained about double the amount of coenzyme A present in normal cells, whereas in the livers of chickens the above ratio of the coenzyme was almost exactly reversed in infected and normal birds, but in ducks the difference was not so great. The increase in coenzyme A associated with the malarial parasite has strengthened the

belief that the latter cannot synthesize this essential growth factor but accumulates it from other sources.

[Coenzyme A, a dialysable factor, has been found in animal tissues and micro-organisms and its discovery has led to partial elucidation of the mechanism of oxidative decarboxylation of pyruvic acid. The coenzyme is a derivative of panthothenic acid and on degradation yields in addition phosphate, adenylic acid and mercaptoethanolamine.] J. D. Fulton

DUBIN, I. N. **Growth of Exoerythrocytic Forms of *Plasmodium gallinaceum* in Epithelial Cells in Tissue Culture.** *Exper. Parasit.* New York. 1954, Sept., v. 3, No. 5, 425-32, 10 figs.

Tissue cultures were maintained, for 5-7 days at a temperature of 38°C., of portions of liver and lung removed from chick embryos infected with *Plasmodium gallinaceum*. The outgrowth from the lung explant consisted of individual macrophage cells, a feltwork of fibroblasts and continuous sheets of homogeneous epithelial cells, and in the last were found young to mature asexual parasites. The liver explant showed macrophages, fibroblasts and small islands of parenchyma. The nuclei of these epithelial cells contained a dense nucleolus and were surrounded by a thick nuclear membrane; the cytoplasm showed vacuoles of fat. This cytoplasm contained parasites in all stages of development and representing at least 2 cycles. The parasites were indistinguishable from forms growing in mesenchyme. [This is apparently the first record of growth of exoerythrocytic avian parasites in liver (or lung) epithelium. The author himself discusses carefully the exact origin of the cells, and concludes that they must be as stated. The illustrations are fairly convincing, particularly of the liver preparations; it would be even more satisfactory if further objective evidence were available, e.g., some histochemical reaction characteristic of the parenchyma cell. Unfortunately, this might not be demonstrable, because, as the author says, in tissue culture the complex process of metabolism may be disturbed and different metabolites may be present, which allow the parasite to grow in the unnatural environment.]

P. C. C. Garnham

HUFF, C. G. **Merozoite Size in Exoerythrocytic Infections of *Plasmodium gallinaceum*, *P. fallax*, *P. lophurae*, and *P. cathemerium*.** *Exper. Parasit.* New York. 1954, Sept., v. 3, No. 5, 433-44, 1 fig.

It is difficult if not impossible to measure the size of exoerythrocytic schizonts of avian malaria parasites, either in smears or sections. Merozoites on the other hand can be measured with accuracy, and observations were made on *Plasmodium gallinaceum* (in chicks, ducklings and bobwhite quails), *P. fallax* (in 2- to 4-week-old turkeys), *P. lophurae* (in 2- to 4-week-old turkeys) and *P. cathemerium* (in canaries). The merozoites of the last species could not be compared with those of the others because of their difference in shape, and were not therefore included in the final assessment. Material from birds inoculated with blood or sporozoites was fixed in Zenker's fluid and stained by the Maximow method. Merozoites in the duck were larger than those in the quail, but differences in size were also found in individual birds of the same species. *P. gallinaceum* merozoites (after blood infections) were 0.94 μ in diameter, and were smaller than those of the other species (1.08 μ *P. fallax*, 1.11 μ *P. lophurae*). During the course of blood-induced infections of *P. gallinaceum*, the merozoites increased in size, possibly because the parasites of erythrocytic origin take

some days to become fully adapted (or "converted") to life in another type of cell; merozoites in the brain were smaller than those found in any other organs. No signs of any separation of the merozoites into 2 types (macro- and micro-) were found in any of the species studied, and this absence of bimodality is probably characteristic of avian malaria.

P. C. C. Garnham

BISHOP, Ann. **The Action of 2:4-Diamino-6:7-Diisopropylpteridine upon *Plasmodium gallinaceum* and its Relation to other Compounds which are Pteroylglutamic Acid Antagonists.** *Parasitology*. 1954, Nov., v. 44, Nos. 3/4, 450-64, 1 fig. [43 refs.]

In continuation of previous work on the development of drug resistance in malaria parasites and its relation to other drugs and essential metabolites [this *Bulletin*, 1947, v. 44, 969; 1950, v. 47, 525; 1951, v. 48, 1085; 1952, v. 49, 673] the author has now prepared a strain of *P. gallinaceum* resistant to 2:4-diamino-6:7-diphenylpteridine (0/63) and to 2:4-diamino-6:7-diisopropylpteridine (0/129). Cross resistance tests have been carried out with other antimalarials whose action is believed to be related to folic acid metabolism. In addition the effect of folic acid and *p*-aminobenzoic acid (PAB) on the activity of the substance 0/129, proguanil (paludrine) and sulphadiazine was also investigated. It was found that the strains of *P. gallinaceum* resistant to 0/129 were resistant to a number of other substances but not to sulphadiazine. Similar results were obtained with the substance 0/63. PAB did not antagonize the action of 0/129 and proguanil on *P. gallinaceum* and folic acid did so only when given in large amounts. PAB antagonized competitively the action of sulphadiazine on the same parasite and folic acid exhibited antagonism only when sulphadiazine was given in small doses.

J. D. Fulton

NARAYANDAS, M. G. & RAY, A. P. **Assay of Antimalarials against the Sporogony Cycle of *P. gallinaceum*. Part II.** *Indian J. Malariology*. 1954, June, v. 8, No. 2, 137-41.

In the first paper in this series the effect of a number of drugs on the development of *P. gallinaceum* in *Aedes aegypti* was described [this *Bulletin*, 1954, v. 51, 149]. Many thousands of mosquitoes were used and the technique of feeding them was then described. In the present investigation solutions of pamaquin, pentaquine and primaquine were used to soak pads of cottonwool from which the mosquitoes imbibed the drug. The infection rate for oöcysts and sporozoites, in mosquitoes which had fed on concentrations of these drugs varying from 1.0 to 0.0001 per cent., is shown in tables. There was a considerable mortality in mosquitoes fed on the higher concentrations of the 3 drugs, especially in the case of pamaquin. In all cases the development of oöcysts appeared to be unhampered. There was only slight variation in the time of appearance of sporozoites in the control and experimental groups, and when they were detected they invariably proved viable. The results described here differ from those of TERZIAN *et al.* [*ibid.*, 1952, v. 49, 486] who reported that certain concentrations of pamaquin were harmful to the sporozoites of *P. gallinaceum* in *Aedes aegypti*.

J. D. Fulton

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—human, animal; American—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

PÉTARD, P. H. & RIDET, H. Sérologie de la trypanosomiase humaine africaine. [**Serological Studies of African Trypanosomiasis in Man**] *Méd. Trop.* Marseilles. 1954, Jan.-Feb., v. 14, No. 1, 78-94. [10 refs.]

A number of patients with trypanosomiasis in the Upper Volta region have been submitted to detailed serological examination before and after treatment with Arsobal, a complex aromatic arsenic derivative. For this purpose fasting blood was obtained from a vein without use of anti-coagulant, and on separation of the serum as soon as possible the following tests were carried out: (1) estimation of the total serum proteins as well as albumin and globulin; (2) examination of serum by electrophoresis on paper; by suitable calculation the percentage of the different globulin fractions was obtained; (3) various liver function tests. In each case the above tests were carried out before treatment started, again 2 weeks after the end of treatment and finally 10 weeks later. Generally a patient in the first stage of the illness was treated with intravenous injections of the drug at a dosage of 3.6 mgm. per kgm. and the second stage treatment consisted of 3 similar doses to the above, one on each of 3 successive days.

The object of the investigation was to observe the changes produced in the blood during the disease and to find if any correlation existed between these changes and the gravity of the illness. The effect of treatment was noted and an attempt made to establish the nature of the electrophoretic pattern in the African with trypanosomiasis. Results indicated that marked differences did occur in blood proteins during the disease but that they did not correspond with the severity of the illness. From the practical point of view serological examinations were not as informative as clinical observations including examination of the cerebrospinal fluid. Treatment of 27 patients with Arsobal was successful and in them no resistance to the drug was encountered; 70 days after its termination parasites could not be found and nervous symptoms had disappeared. The return of the albumin/globulin ratio to a value of 1.0 or over was an indication of the success of treatment. In cases where arsenic resistance was encountered this ratio remained below 1.0, trypanosomes were present in the cerebrospinal fluid and the nervous system was affected in spite of the fact that liver function tests had returned to normal.

J. D. Fulton

RADERMECKER, J. Sur la précocité des modifications E.E.G. dans la trypanosomiase humaine expérimentale. [**Early Electro-Encephalographic Changes in Experimental Trypanosomiasis in Man**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 3, 397-9.

The incubation period of *Trypanosoma gambiense* infection lies between 5 and 20 days. The parasite enters the circulation between the 4th and 7th days after the infecting bite, and this entry is associated with the onset of

nervous excitation and disturbances of sleep. It may be that these early nervous developments are a functional reflex to the parasitic septicaemia.

The author has worked at the Neuro-psychiatric Centre of the Belgian Army. A patient suffering from paranoiac frenzy, which had not yielded to convulsive therapy or to repeated insulin shock treatment, was infected [? subcutaneously] with the blood of a guineapig infected with *T. gambiense*. The following day there was a swelling, and 6 days later an erythematous plaque swarming with trypanosomes; parasites were first found in the blood on the 17th day. On the 30th day the cerebrospinal fluid (CSF) was still normal. On the 34th day there were a great many trypanosomes in the peripheral blood.

Electro-encephalographic (EEG) readings were made on the day of the inoculation, on the following day, and on the 2nd, 9th, 24th, 30th and 34th days thereafter. The first definite changes in the EEG appeared as early as the day after infection. The 4th day after inoculation the recordings were markedly abnormal. On the 9th day the changes in the tracings were generalized and even more marked. During the reading the patient suffered a hypertonic paroxysm resembling an epileptic seizure. [The details of the EEG changes from one reading to another should be sought in the text.]

There were 13 peaks of temperature (38.5° to 39°C.) during the first 6 days of the infection. The first definite improvement in the psychic condition became apparent after the 6th temperature peak. On the 34th day the condition of the patient demanded treatment of his trypanosomiasis, and he was put on Antrypol treatment. Within a week of beginning this both the mental and the physical condition had substantially improved. Two months later the blood was free from parasites, but the cortical rhythm was still labile so treatment was continued for another month. At the end of that time (11th June 1953) the cerebral rhythm had markedly improved and was more stable.

The striking features in this case were:—(1) the appearance of changes in cerebral electrogenesis within 24 hours of trypanosomal infection which preceded by 15 days the appearance of the parasites in the peripheral blood; (2) the EEG changes occurred independently of changes in the CSF; (3) the changes were progressive but responded to Antrypol treatment concurrently with the trypanosomiasis; (4) this particular strain of trypanosomal infection is readily controlled, it can therefore be used in cases of grave psychosis resistant to convulsive and to insulin shock treatment. A. R. D. Adams

RIDET, J. Étude des troubles du cycle menstruel chez la femme trypanosomée à l'aide de frottis vaginaux (étude préliminaire). [Study of Menstrual Disorders in Women with Trypanosomiasis by Means of Vaginal Smears] *Méd. Trop.* Marseilles. 1953, July-Aug., v. 13, No. 4, 514-19, 3 charts.

Disorders in female genital function are usual in women suffering from trypanosomiasis; those who are pregnant suffer abortion, stillbirth, or prematurity with early death of the infant. Genital dysfunction in cases of trypanosomiasis is not confined to one sex; and, in all probability, it is due to endocrinal abnormality. Study of vaginal smears, taken after suitable vaginal preparation from the posterior fornix, has shown that the commonest cause of repeated abortion is a uterine hypoplasia secondary to defective hypophysial and ovarian hormonal secretion.

Studies, by this smear technique, of the menstrual cycles of 150 African and 50 European women have shown no physiological differences between

them. These examinations were also made on 8 African women, who were free from syphilis and gonorrhoea but suffering from trypanosomiasis, of whom 7 had suffered abortions or premature births. The results are set out, and they confirm that genital dysfunction in trypanosomiasis is endocrinal in origin and that it is not, as was once thought, due to a direct action of the trypanosomes either on the genital organs or on the products of conception.

A. R. D. Adams

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

BASHIR, Y. **A Preliminary Report on the Occurrence of Infantile Kala-Azar in Northern Iraq.** *Bull. Endem. Dis.* Baghdad. 1954, July, v. 1, No. 1, 77-80, 1 map.

This is a report on the epidemiology of kala azar in northern Iraq; the clinical details of the 6 cases concerned have been reported elsewhere. Of the 5 places from which the patients came, 3 were within 30 miles of Mosul in a northerly direction and 2 were in the extreme north of Iraq on the borders of Syria and Turkey, respectively. From Tel Kaif, and about 12 miles north of Mosul, 2 cases were reported. The other 2 places of the southern group in which cases occurred were Hatara Khabira and Ba'idhra; these three places were within a radius of 12 miles of one another, but the other 2 infected places, Sili and Pesh Khabur, were 40 miles from one another and more than this distance from any village of the southern group.

Sili is 4,500 feet above sea level; the rest of the places were under 2,000 feet. Hatara Khabira was visited and no more cases were found. No case of dermal leishmaniasis was found and no dogs with suspicious lesions were encountered. *Phlebotomus* were common in the village, but the species were not identified.

The 6 patients were aged 2 to 6 years. The author thinks it possible that these were the first authentic cases of kala azar occurring in Iraq.

He believes that kala azar has only recently become established in northern Iraq. [The epidemiological data so far presented do not seem to support this view.]

L. E. Napier

DELATTE, P. Sur un nouveau cas de bouton d'Orient (clou de Mila) dans le Tell algérien. [**A New Case of Oriental Sore in the Tell Region of Algeria**] *Arch. Inst. Pasteur d'Algérie*. 1954, Sept., v. 32, No. 3, 232-3, 1 fig. on pl.

A boy of 12 lived in Constantine, Algiers, since the age of 9 years. He was in good general health, with no history of illness. In 1954, he developed an ulcer of 25 mm. diameter on the left cheek, on the site of a pruriginous wart which had appeared 4 months earlier. Scrapings showed the ulcer to be rich in leishmaniae. The condition is illustrated in a photograph.

There are two chief foci of oriental sore in the Département of Constantine—one in Biskra in the Sahara and the other in Mila in the Tell. In 5 years, 4 of 6 cases of cutaneous leishmaniasis diagnosed in the laboratory at Constantine came from Mila. Enquiry showed that the boy in question

had not left Constantine for many years, except for a 2-months stay in Mila in the summer of 1953.

The author comments on the comparative rarity of the sporadic cases in the Algerian Tell and considers that in order that their epidemiology might be studied, smears from suspicious ulcers should be sent to the laboratory, together with any *Phlebotomus* found in the neighbourhood.

H. J. O'D. Burke-Gaffney

FORATTINI, O. P. Algumas observações sôbre biologia de flebôtomos (Diptera, Psychodidae) em região da Bacia do Rio Paraná (Brasil). [Observations on the Biology of *Phlebotomus* in the River Paraná Basin Region of Brazil] *Arquivos Facul. de Hig. e Saúde Publica Univ. de São Paulo*. 1954, June, v. 8, No. 1, 15-136, 50 figs. & 6 maps (1 folding). [177 refs.] English summary.

The paper shows evidence of great industry in compilation and contains also a large collection of facts of local interest. It deals with the *Phlebotomus* of an area in the States of São Paulo, Paraná and Matto Grosso, Brazil: considerable numbers of cases of cutaneous leishmaniasis occur there.

Over 35,000 adult *Phlebotomus* were collected, by a variety of methods. A total of 11 species was included. About two-thirds of all the specimens were *P. intermedius*: *whitmani* and *pessoai* were also numerous. The first of these is regarded as the probable vector of the leishmania: it is naturally infected with leptomonads. The paper contains descriptions and photographs of spots in which early stages have been found. P. A. Buxton

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

GEAR, J. **The Rickettsial Diseases of Southern Africa.** A Review of Recent Studies. *South African J. Clin. Sci.* Cape Town. (Incorporating *Clin. Proc.*) 1954, Sept., v. 5, No. 3, 158-75, 5 figs. [20 refs.]

This paper, though primarily intended for medical men in southern Africa, is of great general interest and importance. All the chief human rickettsial diseases except mite-borne typhus are prevalent in the region; their distribution and differential diagnosis have been studied and clarified to an exceptional degree, thanks chiefly to the work of the author, and everyone who has to tackle problems associated with rickettsial diseases in any of the numerous countries which are still backward in knowledge of these diseases will be greatly helped by reading this paper. Most of the recent advances in connexion with the rickettsial diseases that are summarized in the paper have already been published and reference need be made to only a few points. One is that the author has found in southern Africa a Weil-Felix titre with *Proteus* OX19 which, on the average, is as high as with *Proteus* OX2 and in some cases is even higher; on the other hand when the OX2

titre is higher than OX19 the disease is "almost certainly" tick-borne typhus.

The information available in connexion with Q fever in southern Africa is surprisingly scanty in view of the author's statement that since 1950, when the presence of the disease was first recognized on serological grounds, it has become apparent that it is so prevalent that most adult South Africans are immune, whereas recent arrivals from the north-west of Europe are often attacked soon after entering the country.

An interesting problem, still unsolved, is the possible occurrence of rickettsialpox; several samples of serum have yielded complement-fixation reactions at higher titres with *Rickettsia akari* than with *R. conori* var. *piperi*. Some sera reacted only with the antigen of *R. akari*, and one of these was from a patient who had suffered from tick-bite fever three years previously. Experiments on guineapigs showed the existence of a slight degree of cross-immunity between the rickettsiae of tick bite fever and those of rickettsialpox. The author reserves judgment on the question because *R. akari* has not been isolated from any patient and no vector has been incriminated in southern Africa.

John W. D. Megaw

AUDY, J. R. & HARRISON, J. L. **Malaysian Parasites I. Collections made in Malaya by the Colonial Office Scrub Typhus Research Unit.** *Studies from Inst. Med. Res. Federation of Malaya.* 1953, No. 26, 1-22, 3 figs. [20 refs.]

A total of 21,151 vertebrates (and a number of invertebrates) were trapped and examined in Malaya by the Colonial Office Scrub Typhus Research Unit between 1948 and 1952. These included some 115 species of mammals, 30 species of birds and 90 species of reptiles and amphibians. The animals were collected from different types of terrain, i.e., from forest reserves, Kuala Lumpur town, waste lands and villages round Kuala Lumpur and the oil palm estate near Sungei Buloh, which was the site of the scrub typhus outbreak described by FLETCHER and FIELD [this *Bulletin*, 1928, v. 25, 52]. A few rodents were trapped, examined, marked and released again. They were recaptured later and examined for ectoparasites. In addition to this method which the authors refer to as mark-release experiments, mites were also collected from the ears of rats received by post from Singapore and Klang.

The host animals examined are divided into 3 groups, arboreal animals (squirrels, tree rats and tree shrews), terrestrial animals (ground squirrels and ground rats) and domestic species (rats, shrews and the common palm civet, *Paradoxurus hermaphroditus*). Table 3 gives a comparative idea of the relative abundance of the Trombiculid genera, *Trombicula*, *Euschön-gastia* and *Gahrlepiea* on these animals. In addition to these, a few more mammals and birds were also examined. All the data pertaining to the habits, habitats, collection and examination of the host animals were recorded.

Although the purpose of the collection was a study of Trombiculid mites, the relative abundance of this and other groups of ectoparasites such as parasitoid mites, ticks, fleas and lice was observed and recorded. In Table 2 of the paper, the animals examined are divided into squirrels, rats, insectivores, bats and other animals. The majority of these (7,492) were collected from forests and about equal numbers (5,110 and 5,463) were trapped from town and waste land. The vectors of scrub typhus, *T. (Leptotrombidium) deliensis* and *T. (L.) akamushi*, were recorded from squirrels, rats, insectivores and ground birds. A large proportion of the first 3 groups, as well as

monitor lizards (*Varanus*), was found to be infested with Trombiculid and parasitoid mites. The proportion of these animals infested with ticks, lice and fleas was much lower. As a group, bats seemed to be only lightly infested with ectoparasites.

A brief account is given of additional small collections from (1) an abandoned pineapple estate in Johore, (2) a reserve near Port Dickson, Negri Sembilan, (3) Jarak Island in the Malacca Straits [this *Bulletin*, 1952, v. 49, 135], and (4) Nicobar Islands.

M. G. R. Varma

HARRISON, J. L. **Malaysian Parasites X. Feeding Times of Trombiculid Larvae.** *Studies from Inst. Med. Res. Federation of Malaya.* 1953, No. 26, 171-83, 5 figs.

Estimates of chigger populations are necessary for comparing the effects of different variables like weather, soil, acaricides and burning, on these mites. If the feeding times (*i.e.*, the time actually spent attached to the hosts) of different species of Trombiculids are known, then it is possible to estimate their relative abundance. For example, supposing the feeding time of a larval mite is 3 days and there was an infestation of 100 chiggers per rat, then the "turnover" of chiggers would be 33.3 per rat per day or 1,000 per rat per month. If the rat population is known, then the population of the particular chigger species under consideration may be given as a "turnover" of so many chiggers per hectare per month. In a similar manner, populations of other species with different feeding times may be calculated.

In the present paper, the author has estimated feeding times from (1) natural infestations of trapped wild rats and other animals, (2) natural infestations of rats in mark-release experiments [see above], and (3) feeding of laboratory-bred chiggers on immobilized white mice. The third method, although giving straightforward results, has limitations as it is obviously an artificial method of infestation; moreover, mice are not readily acceptable as hosts by chiggers.

The feeding times of mites from trapped wild rats were calculated by 2 statistical methods: (1) the average mode and (2) angular transformation.

(1) *The average mode.* By counting the number of chiggers of a particular species detaching day by day from a wild-caught rat, and constructing a histogram from these numbers, it is possible to see that the mites detach about a certain number of modal times. The number of modal times probably represents the number of separate mass infestations. The mean of all such modal values should be equal to half the true mode of the feeding time. Fig. 3 in the paper illustrates this method clearly.

(2) *Angular transformation.* The theory behind this method may be briefly outlined as follows. If the number of mites attacking a rat each day is approximately the same, then the population of mites on the rats will settle down to a constant number N from which a constant number n leaves daily and to which the same number n is added daily. The mean feeding time will then be $\frac{N}{n}$ which is the inverse of $\frac{n}{N}$, the proportion leaving daily. If the rat is now trapped, the proportion leaving it will be n , but this will steadily go down because the mite population is not being replenished. Therefore the inverse of the proportion of mites leaving the rat on the first day after capture will give the mean feeding time. By calculating the percentages of mites leaving wild-caught rats day by day and plotting these points on a graph, a sigmoidal curve as shown in Fig. 4 of the paper can be obtained. For easier estimation, the percentages are converted into angles (values of

angles are tabulated by FISHER and YATES), plotted on logarithmic paper and a straight line is drawn through the points by eye (Fig. 5). Where this line cuts the axis for day one, will give the angle and hence the percentage for day one. The inverse of this is an estimate of the mean feeding time.

Estimates of the mean, modal and maximum feeding times are given for 21 species and casual records for 15 more.

M. G. R. Varma

LE GAC, P., COURMES, E. & BRES, P. Les acariens susceptibles de jouer un rôle dans la transmission du typhus des broussailles en Indochine. Une nouvelle espèce *Ascoshöngastia monteli*, Marc André 1954. (Première note.) [**Mites capable of playing a Part in the Transmission of Scrub Typhus in Indo-China. A New Species *Ascoshöngastia monteli***] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 3, 392-7, 2 figs.

While revising the collection of mites in the *Muséum National d'Histoire Naturelle*, Paris, Dr. Marc André came across the adults of 2 Trombiculid mites collected from Saigon and Annam in Indo-China. One resembled *Trombicula deliensis*, the vector of scrub typhus and the other *Trombicula wichmanni*. The existence of these mites, coupled with the fact that so far no definite information was available about the transmission of scrub typhus in Indo-China, led the authors to undertake a rodent-trapping campaign. The mites collected from the trapped animals were sent to Dr. André for identification.

During the early part of 1954, a new species *Ascoshöngastia monteli* was collected by the authors from *Rattus norvegicus* and "*Mus jersoni*" in Saigon [this is evidently a misprint for *Mus jerdoni* (see HARRISON and AUDY, this *Bulletin*, 1952, v. 49, 764). Some authorities regard this tentatively as a synonym of *Rattus fulvescens*]. The rôle of the species, which is described and illustrated in the paper, in the transmission of scrub typhus is yet to be determined.

M. G. R. Varma

DE MAGALHÃES, O. Contribuição ao conhecimento da melhor terapêutica curativa do tifo exantemático no Brasil (doença de Piza, Meyer e Gomes). [**A Contribution to Knowledge of Improved Methods of Therapy of Exanthematic Typhus in Brazil (the Disease of Piza, Meyer and Gomes)**] *Mem. Inst. Oswaldo Cruz.* 1953, Dec., v. 51, 475-84, 4 coloured graphs on 4 pls. English summary.

In the summary in English, which is a literal translation of the author's summary, the following statements occur: "The author says that with or without therapeutics 16 to 18 per cent. of the serious cases of Neotropic Exanthematic Typhus in Brazil recovered. For this reason bringing together about 34 cases of the serious forms of the disease, he resolved to publish the following table. Here we see that of the patients treated with Aureomycin, 31.25% died and of those treated with Terramycin, only 6.6%." He adds: "It would be noted that the Terramycin patient was in the Hospital Cicero Ferreira, only seven hours before he died."

From the text and tables it appears that 16 patients were treated with aureomycin and 5 died; 15 were treated with oxytetracycline and one died, but this case cannot be regarded as a failure for the drug because the patient was moribund on admission. The treatment with oxytetracycline was, therefore, remarkably successful; there were 14 consecutive cases, with no death, of a disease whose fatality rate is said to be more than 80 per cent.

But it also appears that if we consider only the cases in which the treatment was started within the first week of the illness there were 9 such cases with 3 deaths in the aureomycin series and 8 with no death in the terramycin [oxytetracycline] series. There was, however, an important difference between the two series; in 6 of the 8 oxytetracycline cases treatment was started on the 2nd to the 4th day after the onset, whereas in the aureomycin series only one of the 9 patients came under treatment as early as the 4th day, and the average delay in starting the treatment would appear to have been about 40 hours longer than in the oxytetracycline series. In so lethal a disease early treatment would be expected greatly to increase the chances of recovery. Three of the cases treated with aureomycin and 4 treated with oxytetracycline were known to have come under treatment more than a week after the onset; these can be left out of account as none of the patients died. There were 4 cases with 2 deaths in the aureomycin series in which the date of onset could not be ascertained and 2 cases with 1 death in the oxytetracycline series with unknown date of onset, so these also can be excluded from consideration.

The two groups of cases appear to have occurred at different periods of time; it is stated that oxytetracycline had not become available at the time when aureomycin was being administered, and periodic fluctuations in the virulence of tick-borne typhus fevers are far from uncommon. The ages of the patients are not given in the table, but age is a very important factor in connexion with the prognosis of fevers of the typhus group.

[The dramatic success of treatment by oxytetracycline has been demonstrated, but it seems right that judgment should be suspended with regard to the relative efficacy of aureomycin (chlortetracycline) unless there is other evidence which has not been stated in the paper.]

John W. D. Megaw

PRICE, W. H., JOHNSON, J. W., EMERSON, Hope & PRESTON, Claire E.
Rickettsial-Interference Phenomenon: a New Protective Mechanism.
Science. 1954, Sept. 17, v. 120, 457-9.

This is a further study of the interference phenomenon in connexion with *Rickettsia rickettsi* and other rickettsiae, which has already been described by one of the authors [see PRICE, this *Bulletin*, 1953, v. 50, 615].

The phenomenon consists in the protection of experimental animals against inoculation with highly virulent *R. rickettsi* by the previous injection at any time less than 10 days of *R. rickettsi* of low virulence. In the experiments now described highly virulent *R. rickettsi*, which had been purified and then inactivated by ultra-violet light, were injected intraperitoneally in measured quantities into guineapigs, which were then found to be protected against challenge doses of highly virulent living *R. rickettsi*. The degree of protection was found to depend on the ratio of the protecting dose to the infecting dose, not on the previous occupation and monopolization of the susceptible tissue cells of the animal by the avirulent rickettsiae. It was found that inoculation with the inactivated organisms 3 hours after inoculation with living virulent organisms conferred no protection. A protective component was isolated from the supernatant fluid obtained by centrifuging purified suspensions of *R. rickettsi* of virulent strains which had been treated with sonic vibration. The supernatant fluid, if not exposed to sonic vibrations, had no protective power.

Details of the numerous experiments on which the above conclusions are based will be found in the paper.

John W. D. Megaw

NOLDEN, J. Eine Q-Fieber-Epidemie in der Nordwesteifel. [**An Epidemic of Q Fever in the North-West of the Eifel District**] *Deut. med. Woch.* 1954, Nov. 19, v. 79, No. 47, 1743-5. [13 refs.]

The author describes briefly and in general terms the clinical and epidemiological features of an epidemic of Q fever in the Eifel district (Germany) which lies just east of Luxembourg. In one village there were 69 cases (17 per cent. of the population); in the other there were 38 (9.5 per cent. of the population). The epidemic occurred in the period between the middle of March and the middle of June 1953.

The clinical features were of the usual types. No infiltration of the lung tissues could be detected by X-ray or physical examination. Apart from an association with the presence of flocks of sheep being kept in the villages during the winter or passing along the local roads on their way to and from their grazing grounds there was no clear indication of the source of the infection. The author agrees that it is impossible to exclude the hypothesis of TERHAAG, who studied the epidemiology of the disease in the same region in 1950 and concluded that the probable cause of infection was the inhalation of dust contaminated by the dried discharges of infected sheep [see this *Bulletin*, 1953, v. 50, 923]. It is suggested, however, that there may be many factors, hitherto unknown, which could be concerned in the epidemiology of the disease.

John W. D. Megaw

SOMAN, D. W. **Q Fever in India. Serological Evidence.** *Indian J. Med. Sci.* 1954, Oct., v. 8, No. 10, 698-703. [14 refs.]

Sera of 739 patients from Bombay hospitals were tested in 1949 for Q fever antibodies at the Haffkine Institute. With the complement-fixation test in which the Henzerling antigen was used there were only 3 positive reactions and these were not regarded as specific. In the same year uniformly negative results were found in 99 sera which had been sent for the Wassermann test and in 43 sera of bandicoots from Poona.

The results of a recent survey on the same lines are now reported. Among 367 samples of human sera 11, derived from 5 patients, were positive; these included 3 sera from one patient which reacted at a titre of 1 in 256 at each of 3 tests made at weekly intervals, but neither this patient nor any of the other 4 who reacted could be suspected on clinical grounds of having had Q fever.

Among 376 sera from sheep 39 gave positive reactions, but all the 142 sera of cattle that were tested failed to react.

John W. D. Megaw

PORTE, L. & CAPPONI, M. Syndrome encéphalitique chez un enfant présentant au décours de sa maladie une réaction positive vis-à-vis de *Rickettsia burneti*. [**An Encephalitic Syndrome in a Child whose Serum gave a Positive Reaction for Q Fever**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 4, 480-82.

A case is described in which the serum of a European child gave a positive reaction with the complement-fixation test for Q fever 21 days after the onset of an attack in which sudden convulsions were followed by coma. There was a short spell of fever on the 2nd day. The treatment included penicillin, aureomycin and chloramphenicol and cure was complete by the 8th day. The child, aged 4 years, was living in Douala (Cameroons), where GIROUD *et al.* have found evidence of infection among workers in the slaughter house [see this *Bulletin*, 1954, v. 51, 365].

John W. D. Megaw

DENGUE AND ALLIED FEVERS

YAOI, H., TAGAYA, I. & OZAWA, Y. **Purification of Dengue Fever Virus by means of Methanol Precipitation.** *Yokohama Med. Bull.* 1954, Apr., v. 5, No. 2, 68–71.

“Dengue fever virus was purified by means of methanol precipitation. Purified preparations were examined under the electron microscope. The size of this virus was determined as ranging from 25 to 35 μ .”

OZAWA, Y. **Studies on Dengue Fever Virus by Electron Microscopy.** *Yokohama Med. Bull.* 1954, Apr., v. 5, No. 2, 72–5, 2 figs. [11 refs.]

“Microscopic study of purified preparations of infected mouse brain showed that the infective particles of dengue fever are spherical, average $34.2 \pm 2.8 \mu$ in diameter, and they are considered to be the virus. The smaller ones of about 14 to 18 μ in diameter seemed to be normal components of mouse brain, because the similar-sized particles were observed also in the normal mouse brain.”

RABIES

TSA-JUNG, C. & CHIN-RONG, T. **Studies on Rabies. 1st Report: the Statistical Observation on Rabies in Formosa (1948–1951).** *Yokohama Med. Bull.* 1954, Apr., v. 5, No. 2, 90–104.

Formosa, which had been without evidence of rabies infection since 1939, became reinfected in 1947–48, as a result of its then increased communication with certain rabies-infected ports on the Chinese mainland. Between 17 June 1948, when the first human case was reported, and 31 May 1953, deaths from rabies among bitten persons totalled 555, including 225 in the year 1951 alone. In the present paper the authors base their observations in general on mortality statistics relating to 433 cases distributed among 17 cities during the period 1948–51 and in particular on details provided with respect to a number of these cases in 115 clinical reports. From such data as are of relevance it is apparent that in a majority of cases specific treatment with “0.5 per cent. phenolised vaccine” was either lacking or inadequately administered. Thus of 115 persons bitten by rabid dogs, 30 received the full course of 14 injections, 25 were given from 5 to 10 injections, and 60 remained without treatment. The ineffectiveness of the vaccine, evidenced by the death of all 30 persons who had received a complete course of treatment, was ascribed, at least in part, to lack of facilities for its cold storage. As for local treatment of wounds, pressure to ensure bleeding, washing with lysol, and, in severe wounding, excision of the affected area were considered “essential for the reduction of mortality or at least for the prolongation of the incubation period.”

Rabies control in Formosa has consisted in a reduction of the dog population—the dog having been proved to be the main transmitter of the virus, with the cat playing a minor rôle—but so far this measure has, admittedly, been inefficiently applied. No canine vaccination has been practised. [The value of this paper lies solely in its recording the incidence of rabies in Formosa since the reintroduction of the infection in 1947–48.]

G. Stuart

IRONS, J. V., EADS, R. B., SULLIVAN, Thelma & GRIMES, J. E. **The Current Status of Rabies in Texas.** *Texas Reports on Biol. & Med.* 1954, v. 12, No. 3, 489-99, 2 figs.

"Data obtained by the Texas State Department of Health Bureau of Laboratories are presented to show that from the standpoint of human mortality rabies is an inconsequential disease. Only 29 human cases have been reported by Texas physicians from 1944 through 1953. However, the prevalence of rabies in dogs, fox, skunks, cattle, and its recently demonstrated presence in insectivorous bats necessitates the expenditure of constant effort to keep down human exposure. In Texas rabies control is in the hands of municipal authorities and little progress is being made in suppressing the disease in the various animal reservoirs. A coordinated state-wide control program is urgently needed."

REMLINGER, P. & HADJI, A. La forme sommeillante de la rage à virus Flury chez le lapin. [**The "Somnolent" Form of Rabies produced by the Flury Strain of Virus in Rabbits**] *Arch. Inst. Pasteur d'Algérie.* 1954, Sept., v. 32, No. 3, 198-9.

The authors refer to the various manifestations of the Flury strain in rabbits [this *Bulletin*, 1953, v. 50, 1037] and in particular to the peculiar "somnolent" type occasionally seen after intracerebral or intraocular inoculation [*ibid.*, 1955, v. 52, 38].

Autopsy findings in these cases are completely negative, but typical paralytic rabies can be obtained within 5-6 days in guineapigs inoculated intracerebrally with nervous tissue from the affected rabbit: this can be reproduced serially in guineapigs.

Evidently the "somnolent" form has to be included in the diverse manifestations of the Flury strain in rabbits.

Whether a virus so different from the others may be found antigenically suitable for the preparation of vaccines and sera has yet to be established and then only by long and wide studies. *H. J. O'D. Burke-Gaffney*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

GIRARD, G. Le virus-vaccin E.V. confère une protection égale vis-à-vis de l'infection pesteuse expérimentale provoquée par les trois variétés de *Pasteurella pestis*. [**Living Plague Vaccine, Type E.V., protects equally against Experimental Infection with all Three Varieties of *Pasteurella pestis***] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 4, 475-8. [12 refs.]

The E.V. type of avirulent *Pasteurella pestis* introduced by GIRARD and ROBIC has already been shown to give complete protection to guineapigs against infection with virulent strains of *P. pestis* of the varieties *orientalis* and *antiqua*, whereas the most effective of the killed vaccines, such as that of the Haffkine Institute, cannot protect guineapigs against these virulent strains, though they do protect mice.

The author now describes experiments which show that the E.V. vaccine protected guineapigs against a strain of *P. pestis* var. *mediaevalis* which had been rendered hypervirulent by 50 successive passages through rats. It also protected mice against the hypervirulent strain of *P. pestis mediaevalis* and so is now known to protect both mice and guineapigs against all the three varieties of *P. pestis*.

John W. D. Megaw

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

CHALAYA, L. E., NOSINA, V. D., BOBKOVA, V. I. & KAMOLIKOVA, Z. Y.
[**Amoebiasis in Turkmenia**] *Med. Parasit. & Parasitic Dis.* Moscow. 1954, No. 3, 260–64. [In Russian.]

The authors report the results of a survey on infections with intestinal protozoa carried out in 1951–52 in the Turkmen Soviet Republic (Middle Asia). The total number of persons involved was 644, whose stools were examined fresh, and in preparations stained with Lugol's iodine and Heidenhain's haematoxylin.

The incidence of infections in different localities among the healthy population of 3 age-groups was as follows (per cent.): (a) children 1–3 years old: *Entamoeba histolytica* 6, *Giardia* 45, *Trichomonas* 25; (b) children up to 14 years old in Russian and Turkmen schools (1st and 2nd figures respectively): *E. histolytica* 27, 32, *Giardia* 31, 14, *Trichomonas* occasional, 7; (c) adults: *E. histolytica* 21.3, *Giardia* 9.5, *Trichomonas* occasional.

Previous data, indicating that about a half of all the acute intestinal disorders in Turkmenistan are due to amoebiasis, have been disproved by the present investigators, who found that, in the areas covered by the survey, clinical amoebiasis was present in only 2–8 per cent. of all cases of acute intestinal disorders. They have also shown that the proportion of patients suffering from clinical amoebiasis is considerably smaller than the total number of persons harbouring *E. histolytica*. Furthermore, in persons with intestinal disturbances the finding of lumen forms and cysts of this parasite cannot be regarded as evidence of amoebiasis unless the tissue [haematophagous] forms are present.

As regards the flagellates, the incidence of *Giardia*, *Trichomonas* and *Chilomastix* among healthy persons and patients suffering from intestinal disorders was found to be similar, therefore there are no grounds for attributing to these flagellates an aetiological rôle in these diseases.

C. A. Hoare

CAPOCACCIA, L. & CAO-PINNA, M. Un terreno a base di uovo, fegato ed agar per la coltivazione dell'*Entamoeba histolytica*. [**Medium with Egg-Liver-Agar Base for Cultivation of *Entamoeba histolytica***] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1954, Mar., v. 35, No. 3, 131–3. [16 refs.] English summary (3 lines).

The authors describe a new diphasic medium for the cultivation of *Entamoeba histolytica*, in which the factors present in egg and liver are

combined. Its composition and preparation are as follows: one whole egg and the yolk of another are beaten up, and mixed with 15 cc. of Locke's solution; 100 cc. of 2 per cent. agar (in an infusion of heart and brain) are sterilized, cooled to 55–60° C., and mixed with the egg preparation; this mixture is homogenized by vigorous shaking, after which liver extract (equivalent to 1,500 gm. of the organ) is added to it; the resulting mixture is then shaken again, and distributed in test-tubes which are placed in an inspissator, where they are kept for one hour at 80°C. in order to sterilize and solidify the egg components; the medium is then cooled at a temperature which leaves the agar fluid. Finally, the slope is covered with Ringer-serum (6:1), and the medium is ready to be used.

This medium is used by the authors both for the isolation and maintenance of cultures of *E. histolytica*, and is considered to be superior to other media.

C. A. Hoare

KALK, H. & WILDHIRT, E. Ueber das Vorkommen von Amöben im Duodenalsaft und in der Galle. [**The Presence of Amoebae in the Duodenal Juice and in the Bile**] *Med. Klin.* 1954, Sept. 10, v. 49, No. 37, 1466–8.

Amoebae in duodenal juice and bile sediments were examined by phase contrast microscopy. During 12 months *Giardia* was found in 1.05 per cent. and amoebae in 3.2 per cent. among 1,268 patients. In 41 cases amoebae were present in the duodenal juice as well as in the bile. The diagnosis in this series was as follows: hepatitis, 7; cirrhosis of liver, 2; carcinomatous metastases, 1; haemolytic icterus, 2; gastric and duodenal ulceration, 2; normal, 27. Leucocytes were found in the sediment in association with amoebae, and in one-quarter of the cases concomitant infections with *Bact. coli* and enterococci were encountered. In some instances an association with *Giardia* was present.

The results of therapy in 25 cases are given as follows. In 16, Acranil (3 tablets [quantity not stated] daily for 5–10 days) was followed by disappearance of amoebae and at the same time the liver decreased in size, the transient eosinophilia disappeared and symptoms subsided. The amoeba was identified as *Entamoeba coli* and this organism is considered by the authors to exist for the most part as a harmless saprophyte in the faeces, but may wander into the duodenum and biliary tract and therefore, like *Giardia intestinalis*, can become pathogenic. They postulate that the clinical picture thus produced resembles cholecystitis, without cholelithiasis. The best treatment is with Acranil and Resotren [this *Bulletin*, 1952, v. 49, 620], but in some cases this is not effective and the amoebae persist.

Philip Manson-Bahr

AL-HAMAMI, A. **Aureomycin in the Treatment of Amoebiasis: Preliminary Report.** *Al-Mihan Al-Tibbiyah.* Baghdad. 1953, Mar.–June, v. 1, Nos. 1/2, 4–7.

“1. A preliminary investigation was carried out to determine the value of aureomycin in amoebiasis.

“2. Seven cases were included, five of which were chronic, one was acute and one had a liver abscess.

“3. The results obtained were encouraging and warrant further investigations.

“4. The toxic symptoms observed were nausea and vomiting.”

SOHIER, H. M. L., CHARMOT, G. & PELLEGRINO, A. Streptokinase et streptodornase dans le traitement des abcès du foie par ponctions. [**Streptokinase and Streptodornase in the Treatment of Liver Abscess by Puncture**] *Bull. Méd. de l'Afrique-Occidentale Française*. 1953, v. 10, 127-32, 4 coloured figs. on 2 folding pls.

Streptokinase and streptodornase have already successfully been used for the liquefaction of the contents of an amoebic liver abscess [this *Bulletin*, 1952, v. 49, 399]. The authors have used them in the resolution of 2 further cases of amoebic liver abscess, details of which they here record.

A. R. D. Adams

BERÉZOVAYA, A. V. [**Clinical Course and Treatment of Human Balantidiosis**] *Med. Parasit. & Parasitic Dis.* Moscow. 1954, No. 3, 265-7. [In Russian.]

The author describes 22 cases of human balantidiosis observed between 1949 and 1953 at the Kuban Medical Institute [Northern Caucasus]. In all these cases previous contact with pigs was established. In the majority of the patients the disease ran a chronic course, with acute relapses, and symptoms of dysentery or enterocolitis. The lesions in the colon were represented by typical crater-shaped ulcers. Treatment with Acriquine [mepacrine], "Osarsol" [acetarsol] and emetine failed to produce a radical cure, for in many cases it was followed by exacerbation of the disease.

In an editorial footnote to this paper it is stated that the most effective treatment of balantidiosis is by parenteral administration of "Aminarson" [carbarsone] combined with gramicidin enema, and biomyacin is said to be also effective [dosage not mentioned].

C. A. Hoare

RELAPSING FEVER AND OTHER SPIROCHAETOSSES

MASSEGUIN, A. & PALINACCI, A. Parasitisme des glandes salivaires d'un *Anopheles gambiae*, par un spirochète. [**Presence of a Spirochaete in the Salivary Glands of *Anopheles gambiae***] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 3, 391-2.

The authors previously recorded [this *Bulletin*, 1954, v. 51, 1066] the finding of a spirochaete in the salivary glands of *Anopheles funestus* in the Upper Volta region. They have since found a similar one 3 times in that region and, in February 1954, in a Niger village.

During a malaria survey in French Sudan they also found a similar spirochaete in the salivary glands of a female *A. gambiae* caught at Gao.

They remark upon these findings being recorded in areas at a considerable distance from each other.

H. J. O'D. Burke-Gaffney

HEISCH, R. B. *Ornithodoros moubata* (Murray) in a Porcupine Burrow near Kitui. *East African Med. J.* 1954, Oct., v. 31, No. 10, 483.

YAWS AND OTHER TREPONEMATOSES

VARELA, G. & PALENCIA, L. Estudios de inmovilización del *Treponema carateum* con sueros sanguíneos y líquidos cefalorraquídeos. [**Blood-Serum and Cerebrospinal Fluid and Immobilization of *Treponema carateum***] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1954, June, v. 14, No. 2, 103-11, 5 graphs. [27 refs.] English summary.

The treponemata used by the authors for their tests were obtained from a patient suffering from *mal del pinto*, with large numbers of treponemata (16 per field) in lymph collected by the Lleras method, as recorded by DE SOUZA-ARAUJO in 1943 [this *Bulletin*, 1944, v. 41, 220]. The arrest of motility was tested with the blood serum of leprosy patients giving a positive reaction to the Mazzini and Kahn tests; the serum of rabbits with "rabbit syphilis" giving the same reactions; with cerebrospinal fluid from pinta patients, with that of syphilitics and with normal fluid [c.s.f.].

They put up the following series of combinations and noted the motility or loss of motility after 1, 2 and 3 hours: (i) the treponemata in normal serum; (ii) in serum from a pinta patient; (iii) in serum from a patient with nodular leprosy; (iv) in serum of a rabbit with *T. cuniculi* infection; (v) in c.s.f. from a pinta patient; (vi) in the c.s.f. of a syphilitic; and (vii) in c.s.f. of a normal subject. As controls they observed the effect of lymph from a pinta patient and that of normal serum and of normal c.s.f. on the motility of the treponemata. The results are presented in tables and a series of graphs, but are succinctly summarized in the authors' words as follows:

"The blood sera from patients with nodular leprosy which gave positive luetic tests did not immobilize *Treponema carateum*. The sera from rabbits with rabbit syphilis (*T. cuniculi* infection), only partially immobilized *T. carateum* to a lesser degree than that which we obtained from sera from patients with pinta.

"Spinal fluid from pinta patients which gave negative standard luetic tests, gave positive immobilization reactions and spinal fluid from syphilitic patients which gave positive tests were positive to a lesser degree with the immobilization test."

H. Harold Scott

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

FLOCH, H. Le "Mycobacterium marianum" est-il ou non un bacille lépreux? [**Is "Mycobacterium marianum" the Leprosy Bacillus?**] *Bull. Acad. Nat. Méd.* 1954, v. 138, Nos. 25/26, 410-15. [Refs. in footnotes.]

A strain of mycobacterium, at first called the bacillus "*Chauviré*" and later *Myco. marianum*, was isolated from a human leproma in Lyons by Sister MARIE-SUZANNE. The object of this article is to discuss whether or not this organism is *Myco. leprae*. The test adopted is that suggested by MUIR [this *Bulletin*, 1935, v. 32, 341] in 1934. The Mitsuda type of intra-dermal reaction is used as a test whether or not an organism isolated from leprous lesions is *Myco. leprae*. The latter almost invariably gives a

negative reaction in lepromatous cases, whereas other mycobacteria give a positive reaction in such cases.

The author chose 76 patients, of whom 21 were tuberculoid, 33 undifferentiated, 4 borderline, and 18 lepromatous. Each patient was inoculated intradermally with Mitsuda antigen and with an antigen received from Sister Marie-Suzanne. In the tuberculoid cases reactions with both antigens were positive except in 1 case where the Mitsuda was negative. In the undifferentiated cases all were positive with *Myco. marianum*, but 10 Mitsudas were negative. In the borderline cases all 4 *Myco. marianum* were positive but only 2 Mitsuda. Of the lepromatous cases all the *Myco. marianum* were positive, but only 2 of the Mitsuda. Thus according to this test there was very wide divergence between the two organisms.

In a personal note to the author from Sister Marie-Suzanne she says that the Mitsuda antigen is not a pure culture like the other antigen, but is mixed with tissue debris, and this debris may account for the different reactions obtained. The author, however, quotes the work of DE AQUINTO (*Anais do X^e Congresso Brasileiro de Higiene*, 1953, 740), who prepared an antigen from tuberculoid lesions in which there were very few lepra bacilli. This was tried against the ordinary Mitsuda antigen in 53 patients. The tuberculoid antigen never produced a positive reaction when the Mitsuda reaction was negative, but out of 44 reactions which were negative with the tuberculoid antigen 8 were positive with the antigen prepared from leproma, and the positive reactions with the latter were always much stronger than those with the tuberculoid antigen. Besides this, the antigen of DHARMENDRA, in which the lepra bacilli are freed from tissue debris, gives the same results: as the ordinary Mitsuda antigen, though the delayed reaction is feebler on account of the modification caused by extraction with chloroform and ether.

The author concludes that *Myco. marianum* is not *Myco. leprae*; it is neither the bacillus of Hansen nor is it "one of the bacilli" of Hansen. That this organism can convert a certain proportion of negative Mitsuda reactions into positive is not considered as evidence of its identity with Hansen's bacillus, as such a conversion is produced by vaccination with BCG and other mycobacteria.

Ernest Muir

DE SOUZA ARAUJO, H. C. La lepra. Su probable transmisión por los artrópodos. [**Leprosy, its probable Transmission through Arthropods**] *Bol. Epidemiológico*. Mexico. 1952, Jan.-June, v. 16, No. 1, 3-6.

Examples are given of the finding of acid-fast bacilli, sometimes in large numbers, in the bodies of mosquitoes (*Culex*, *Anopheles*, *Aedes*), ticks (*Amblyomma cajennense*), *Triatoma infestans*, and lice, after they had fed on lepromatous patients. The 4-month-old child of a lepromatous woman showed acid-fast bacilli on examination of erythematous patches round mosquito bites on its face.

It is suggested that with the cooperation of the malaria department an attempt should be made to investigate and finally settle the question of transmission of leprosy infection by insects.

Ernest Muir

SAGHER, F., LIBAN, E. & KOCSARD, E. **Specific Tissue Alteration in Leprous Skin. III. Specific Reaction due to Various Agents.** *J. Investigative Dermat.* 1953, May, v. 20, No. 5, 343-52, 8 figs. [10 refs.]

This paper is part of a series [see this *Bulletin*, 1954, v. 51, 67, 938]. Seventeen leprosy patients, all with lepromatous leprosy except one with

the undeterminate type, were chosen. Of these 11 were inoculated intradermally: 5 with leishmanin (a suspension of flagellates of *Leishmania tropica*); 5 with milk; and 1 with peptone. Of the rest 1 had a sandfly bite and 5 were suffering from eruptions resembling erythema nodosum. As controls 41 biopsies were taken from 34 leprosy patients. The authors found that the inoculations elicited "a specific foam cell reaction typical for leprosy". The reaction to the sandfly bite was similar. In the control group foam cells were not found in 2/3 of the cases, and only slight infiltrations in the remainder. In a second control group composed of 13 non-leprosy patients with cutaneous leishmaniasis injection of leishmania vaccine produced a "non-specific inflammatory reaction of the dermis". The authors conclude that "leprosy causes a specific altered reactivity of the skin which reacts to injury with a histological picture characteristic of the host's tissue response".

Ernest Muir

KOCSARD, E. & SAGHER, F. **Specific Tissue Alteration in Leprous Skin.**

III. [? IV.] Specificity of the Tuberculin Reaction in Lepromatous Leprosy. *J. Investigative Dermat.* 1953, Aug., v. 21, No. 2, 69-70.

Out of 24 lepromatous patients examined 12 were positive to PPD (purified protein derivative of tuberculin), and 12 negative. The 12 PPD-negative and 9 of the PPD-positive patients were inoculated with BCG. The former gave delayed late papular reactions, but the latter showed the Koch phenomenon with extensive reaction occurring within 24 hours and followed by ulceration. The conclusions are that there is no specific anergy to tuberculin in lepromatous leprosy, but the tuberculin reaction shows the same specificity as in the general population, as most of the PPD-negative patients with leprosy became positive (10 out of 12) after BCG, and PPD-positive reactors showed the Koch phenomenon.

Ernest Muir

SAGHER, F., LIBAN, E. & KOCSARD, E. **Specific Tissue Alteration in Leprous Skin. VI. "Isopathic Phenomenon" following BCG Vaccination in Leprous Patients.** *Arch. Dermat. & Syph.* 1954, Nov., v. 70, No. 5, 631-9, 5 figs. [33 refs.]

In this paper [see above] Sagher and his colleagues describe the effect of injecting BCG into lepromatous patients intradermally, the dermal reaction producing a histological picture similar to that of leprosy, whereas a similar injection in tuberculin-negative healthy children produced a picture characteristic of tuberculosis. It is suggested that it might be possible to detect the presence of active leprosy in this way in early cases. "As an extension of this, vaccination might be of value in determining the effectiveness of treatment. Several observations seemed to indicate that after intensive and effective chemotherapy the characteristic lesion did not develop at the site of BCG inoculation."

Ernest Muir

BLUM GUTIÉRREZ, E. **Lepromina preparada a partir de ganglio linfático formolizado. [Lepromin prepared from Formolized Lymph Nodes]** *Rev. Ecuatoriana de Hig. y Med. Trop.* Guayaquil. 1954, Jan.-June, v. 11, Nos. 1/2, 106-10.

As the grosser forms of lepromatous leprosy have become more uncommon the author has found it increasingly difficult to obtain fresh leproma from

which to prepare lepromin without causing mutilation of patients, especially as the prominent lesions are generally on the face. The same difficulty has also been experienced in other South American countries. In the pathological department of the Hygiene Institute in Guayaquil there were available lymph nodes which had been excised from a child with lepromatous leprosy, and which were rich in acid-fast bacilli. As these nodes had been preserved for 2 years in formalin the author considered that their value for preparing lepromin would have been destroyed. But on preparing a suspension by the usual Mitsuda method and trying it out on leprosy patients of all types he obtained results comparable with those expected with antigen from fresh leproma. The advantage of using formalized leproma is that small pieces of tissue can be collected as occasion permits, and then suitable quantities of antigen prepared as required. A note is added mentioning that in Brazil lepromin antigen prepared from tuberculoid lesions had been found useless.

Ernest Muir

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (schistosomes, other flukes); CESTODES (Diphyllobothrium, Taenia, Echinococcus, other cestodes); NEMATODES (Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.).

WATSON, J. M. **Studies on Bilharziasis in Iraq. Part IX. Relationship of Incidence to Occupation.** *Al-Mihan Al-Tibbiyah*. Baghdad. 1953, Mar.–June, v. 1, Nos. 1/2, 13–18.

It has gradually been assumed, without statistical evidence, that urinary schistosomiasis is primarily a disease of children and agricultural workers in the irrigated areas of North Africa and the Middle East, where it is endemic. The author's extensive studies in Iraq presented a favourable opportunity of studying this question. He had already deduced [this *Bulletin*, 1953, v. 50, 223] that it is not an occupational disease, but that domestic and personal activities exposing persons to infective water played a more important part. The present studies confirm this view.

Among 31,800 males belonging to 91 occupations, 7,797 (24.5 per cent.) were positive for *S. haematobium*. Preliminary analysis showed that data were insufficient to compare all the individual occupations, so they were collected into 21 occupational groups.

The results are tabulated for each group. Workmen had an average infection rate of 25.3 per cent. Above that, fishermen, agricultural labourers and gardeners who have daily contact with waters showed rates of about 33 per cent. but so also did such persons as street-traders, porters and the unemployed, whose callings do not ordinarily expose them to infection. On the other hand, many other groups, such as soldiers, drivers and policemen showed rates of only 15 to 19 per cent.

The author therefore concludes that urinary schistosomiasis in Iraq is a social rather than an occupational disease: those having high rates of infection were financially poor and often obliged to use infective water for washing, bathing and drinking. Others, like public servants or those in the Services, were better off, better clothed and shod, and receive special

medical care. The disease is clearly associated with low income and poor housing in proximity to infected waters, rather than to a particular occupation as such.

H. J. O'D. Burke-Gaffney

ZAKARIA, Hannah. Notes on Human Schistosomiasis in Iraq, with particular regard to the Bionomics of the Intermediate Host, *Bulinus truncatus* Baylis. *Bull. Endem. Dis.* Baghdad. 1954, July, v. 1, No. 1, 46-52, 1 map.

The author describes the environmental features and human usage of a site of infection for *Schistosoma haematobium* in an irrigation canal 41 km. from Baghdad. The numbers of freshwater snails in several sections of the canal have been assessed on 4 occasions within one year. *Bulinus* sp. may be as abundant as 400 individuals per square metre, and *Lymnaea* sp. and *Planorbis* sp. occur. Some assessment has been made of the available food supply for these snails, and the gut contents of one sample of *Bulinus* examined. The distribution of *Bulinus* appears to be related more to shade and natural food supply [and perhaps more to the physical nature of the substratum] than to human and animal pollution.

[Such preliminary accounts of the ecology of a host snail would be valuable from many regions, and the present study is well worth extending. Unfortunately, in the text of the paper the specific identities of the snails discussed are nowhere mentioned.]

W. Russell Hunter

HUBENDICK, B. Viewpoints on Species Discrimination with special attention to Medically Important Snails. *Proc. Malacol. Soc. of London.* 1954, Aug. 19, v. 31, Pt. 1, 6-11.

In considering the theoretical background, the author notes that a "natural classification" can never be guaranteed to result from morphological delimitation of species. He adopts the modern concept of a species as a group of actually or potentially interbreeding natural populations, which is reproductively isolated from other such groups of populations. The homogeneity of any species is sustained by thorough panmixia, while the origin of specific divergence lies in reproductive isolation of populations.

Hubendick notes that experimental interbreeding remains the only absolute criterion of species in closely related forms. He further points out that differing forms which are not isolated cannot be considered as sub-species or races of one species (*i.e.*, differing on genetical grounds), but must be ecophenotypes of one species, or else belong to distinct species. Together, without isolation, separate races of one species cannot continue to exist. Successful interbreeding in nature is prevented on the one hand by cytogenetic incompatibility resulting in sterility, and on the other by sexual separation (mechanical, ethological or ecological). It is probable that only the former is important in delimitation of species in basommatophoran snails, the latter factor being of less importance in this group, since mating discrimination in species of *Lymnaea* and *Planorbis* is not always strict. Further, self-fertilization is extensive and probably important. In view of this, Hubendick believes that reliable demarcation of species may come from chromosome studies or serological diagnoses [the latter type of separation could be of very *real* significance in determining the appropriate host of a parasite]. Compared to populations of marine or land snails, fresh-water populations are generally more isolated, though their isolation may be restricted in time (*i.e.*, in number of generations). Many fresh-water snails are suitable material for the most extensive passive dispersal. As a result

they form a comparatively small number of species, mostly each of vast geographic range, in which there are numerous comparatively well isolated populations, resulting in great intra-specific variation.

Turning to the more practical aspects of species discrimination, the author distinguishes between the methods which have to be applied for the initial demarcation of the species, and those methods which will serve for the routine identification of already defined species (any reliable methods, not necessarily convenient, may be used for the first process, which remains the work of the professional malacologist; while anyone engaged in work on schistosomiasis should be able to undertake the second, which must therefore be based on distinguishing characteristics readily recognizable). In relation to this Hubendick surveys the morphological characters which can be used in species discrimination in the snails important to medicine, and evaluates them. The shell remains of great importance, but statistical treatment of morphometric results is urged, and may allow separation of ecophenotypic from genetic variation. Internal characters of the shell and microsculpture should not be neglected. Anatomically the organs of the mantle and alimentary canal may occasionally be useful. The radula, on account of intra-specific variation, is not of great use in classification below the level of genera. Of the internal organs, the reproductive system is most useful, but here specific characters may be obscured by stages in growth and maturation, and by variation in fixation in preserved material. To counteract the latter effects, Hubendick proposes a simple standard technique for the preparation of anatomical material. Snails are anaesthetized for 10 to 24 hours in a closed water-filled jar, a few drops of a solution of 24 gm. menthol in 10 cc. ethyl alcohol having been added after the first emergence of the snails. The relaxed animals are then fixed in a mixture of two parts 80 per cent. alcohol with one part 40 per cent. formalin, for 24 hours, and then transferred into and stored in 70 per cent. alcohol. Penetration of the fixative should be aided in a few specimens by cracking of the shell. Hubendick concludes that it is impossible to generalize on which characters are most useful for species identification in medically important snails. Different cases may require different features, but once the original demarcation of the species has been carried out it becomes important to set up simple distinguishing criteria. Absence or presence of a feature should be preferred to differences in a feature which shows continuous variation. Internal organs utilized must be readily dissected.

[Though short, this paper is of great importance since it presents in summary the considered views of the author, who not only is one of the foremost museum malacologists in Europe, but who has field experience of the medically important snails (particularly *Oncomelania*). It is worth emphasizing the distinction which he makes between the kind of characters used in the original diagnosis of a new species, and the kind of characters which are subsequently most useful in routine identification of that species.]

W. Russell Hunter

PELLEGRINO, A., CHARMOT, G., PARIS, P. & GIUDICELLI, P. L'intérêt de l'urographie intraveineuse dans la bilharziose urinaire. [Value of Intravenous Pyelography in Urinary Schistosomiasis] *Bull. Méd. de l'Afrique-Occidentale Française*. 1953, v. 10, 261-6. [12 refs.]

X-ray examinations and intravenous pyelographies [IVP] were done on 23 young civilians and soldiers with urinary schistosomiasis in hospital at Dakar. In 11 of them no changes were evident on these examinations but the remaining 12 patients had structural and functional changes in the

urinary system. In 4 of these 12 there was no calcification in the bladder wall; 3 of these 4 had only slight dilatation of the lower third of one or both ureters, but the fourth had a contracted bladder with tortuosity of the ureters and dilatation of the renal pelves and calices. The other 8 of the 12 patients, all of whom suffered from vesical stasis, showed calcified concretions in the bladder wall; 5 had hydronephrosis and 3 had grossly dilated and rigid ureters with calcified walls, and marked renal abnormalities. The degree of damage seen radiologically and on IVP was directly proportional to the intensity and the duration of the schistosomal infections.

Cystoscopy of these 23 patients confirmed the presence of lesions around the ureteral orifices in the bladder in all those in whom the IVP was abnormal. The authors believe the involvement of the ureters to be an ascending one. If the condition is treated early irreversible damage to the kidneys can be forestalled and prevented. X-ray examinations will show changes in the bladder and ureters which are pathognomonic of schistosomiasis in Africans under circumstances where neither cystoscopy nor urine examination has established the diagnosis. IVP in cases of schistosomiasis will reveal the relative frequency of renal changes in these cases.

A. R. D. Adams

USBORNE, V. **Some Notes on Urinary Bilharziasis in Sukuma School Children especially as regards Scholastic Performance.** *East African Med. J.* 1954, Oct., v. 31, No. 10, 451-8, 4 figs.

The author was lately Research Officer with the East African Medical Survey; the investigations were done on members of the Wasukuma tribe in Kwimba district of Sukumaland, Tanganyika. Urinary schistosomiasis is common there, but intestinal schistosomiasis also does occur. He studied 367 children in 3 schools; only a few of them were girls. Centrifuged deposits of terminal urine from each child, collected after exercise, were examined for red cells and ova on two or three occasions; a history of urinary symptoms was sought in each case, and it was found that the majority of the children had already had some tartar emetic injections during the preceding year or two. The infection rates with schistosomes among the pupils in the 3 schools were found to be very high; in one school it was "probable that 100 per cent were actually infected"; in another 92 per cent. were passing ova and 96 per cent. blood; and in the third it seemed to be "a little lower". It seemed, on analysis, that the severity of the clinical manifestations of the urinary schistosomiasis bore no relation to the standard of scholastic work of the children. During the study it emerged that the older children, with proven infections, suffered fewer symptoms and had less haematuria than the younger. This suggests the development of tolerance of, or immunity to, the infection at about puberty.

A. R. D. Adams

WALKER, A. R. P., FLETCHER, Dorothy C. & TRAILL, Vivien. **An Investigation of Haemoglobin Concentration and of Blood Loss in Stools in Adult South African Bantu infested with Intestinal *Schistosoma mansoni*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Nov., v. 48, No. 6, 501-5. [17 refs.]

Continuing their studies on blood loss as a result of *Schistosoma haematobium* infection [this *Bulletin*, 1953, v. 50, 730] and of hookworm infection [*ibid.*, 1954, v. 51, 1078] the authors, at the South African Institute for Medical Research, have investigated the blood loss due to *S. mansoni* infection of Bantu mine workers.

As there are no parts of South Africa where *S. mansoni* is found in the complete absence of *S. haematobium* infection, pure infections with the former parasite could not be assumed. In addition to this other concurrent diseases and factors affecting the haemoglobin levels could not be excluded as contributory causes of blood loss.

The authors studied Bantu mine workers, with and without *S. mansoni* ova in their stools but otherwise medically fit, and a number of Bantu farm workers from another area, for whom detailed clinical information was not available. The areas from which these groups are drawn are known to have a high infection rate with both types of schistosomiasis. The haemoglobin levels of members of each group were determined on venous blood by the oxyhaemoglobin method, and the presence of blood in the stools was sought for by a simple chemical test. The results as set out in tables show no significant differences in the mean haemoglobin levels of the various groups, and the mean values of each lie within the limits normal for healthy Europeans, after a suitable correction for altitude. The loss of blood in the stools, resulting from these *S. mansoni* infections, was irregular and small in gross amount.

A. R. D. Adams

RUIZ, J. M. Contribuição ao conhecimento das formas larvárias de trematóides brasileiros. 4. Nota sobre o sistema excretor da cercária de *Schistosoma mansoni*. [Larval Forms of Brazilian Trematodes. 4. Note on the Excretory System of the Cercariae of *Schistosoma mansoni*] Mem. Inst. Butantan. 1953, v. 25, No. 2, 45-53, 4 figs. [24 refs.]

The English summary appended to the paper is as follows:—

“A study of the excretory system of the *Schistosoma mansoni* cercariae was undertaken.

“The presence of two ciliated areas was seen near the basis of the posterior collecting channels, *Cp*².

“Formula of the excretory system is equal to $2(2+2 (+1)) = 8(+2)$ in 68% and $2(2+1 (+1)) = 6(+2)$ in 32% of the 25 specimens that were examined. Two guinea-pigs were infected with cercariae from the same mollusc. After the prepatent period only several males of *Schistosoma mansoni* were recovered.”

RUIZ, J. M. Esquistossomose experimental. 4. *Nasua narica* e *Didelphis paraguayensis*, animais sensíveis à infestação experimental pelo *Schistosoma mansoni*. [Experimental Schistosomiasis. 4. *Nasua narica* and *Didelphis paraguayensis*, Animals Susceptible to Experimental Infection with *Schistosoma mansoni*] Mem. Inst. Butantan. 1953, v. 25, No. 2, 23-7.

The English summary appended to the paper is as follows:—

“One ‘coati’, *Nasua narica*, and five ‘gambás’ (opossum), *Didelphis paraguayensis*, were submitted to experimental infection with *Schistosoma mansoni*.

“Egg elimination in ‘coati’ was observed in stools on the 54th day after infestation. Examinations of stool after this period, in number of four, showed typical eggs of *S. mansoni*.

“The first ‘gambá’ did not show any apparent infection; examination of stools, mucosae of the large intestine and rectum and perfusion of the portal system were negative.

"Two 'gambás' presented a weak infection with only male *S. mansoni*.

"The fourth 'gambá' presented a double sex infection (16 males and 2 females adult worms) but only in the necropsy was seen one egg in stool (4 months and 11 days after exposure to infection).

"The fifth 'gambá' has not yet been submitted to necropsy. Examinations of stools for *S. mansoni*'s eggs were negative to this date."

RUIZ, J. M. Processo rápido de perfusão do sistema porta de mamíferos para coleta de esquistossomatídeos, aplicável aos trabalhos de campo. [**Rapid Method of Portal Perfusion of Small Animals for obtaining Schistosomes**] *Mem. Inst. Butantan*. 1953, v. 25, No. 2, 29-33, 1 fig. on pl. English summary (5 lines).

In 1951 PAN and HUNTER described a method of perfusion for recovery of schistosomes from small animals [see this *Bulletin*, 1951, v. 48, 1012]. The following year RUIZ wrote again on this procedure [*ibid.*, 1954, v. 51, 193]. Both of these described a modification of the method previously recorded by YOLLES *et al.* in 1947 [this *Bulletin*, 1948, v. 45, 349]. The present contribution goes into little more detail than that described by Pan and Hunter, showing the applicability of the procedure to small animals in the field. The illustration accompanying the paper makes the whole process clear as described in the *Bulletin* abstract in 1951. *H. Harold Scott*

RUIZ, J. M. Contribuição ao estudo das formas larvárias de trematóides brasileiros. 5. Descrição de três furcocercárias que ocorrem em planorbídeos hospedeiros do *Schistosoma mansoni*. [**Larval Forms of Brazilian Trematodes. 5. Description of Three Furcocercariae which Occur in Planorbid Hosts of *Schistosoma mansoni***] *Mem. Inst. Butantan*. 1953, v. 25, No. 2, 77-89, 18 figs. on 3 pls. [17 refs.]

The English summary appended to the paper is as follows:—

"Two furcocercous cercariae of the pharyngeata-longifurcata type were described: *Cercaria caratinguensis*, sp. n. and *Cercaria amplicocata* sp. n.

"A redescription of the cercaria of *Clinostomum heluans* Braun, 1899 (*Dicranocercaria ocellifera* Lutz, 1919) is given."

MAZZOTTI, L. Incidência de *Cysticercus cellulosae* en cerdos de diferentes localidades de la República Mexicana. [**Incidence of Cysticercosis in Pigs in Different Regions of Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1954, June, v. 14, No. 2, 53-6.

The English summary appended to the paper is as follows:—

"The results of examining pork for *Cysticercus cellulosae*, in slaughter houses from 17 states of Mexico, are reported. Four and six tenths percent of 73,386 hogs were found to be infected."

VALENTE, J. L. P. Sobre a incidência da anquilostomíase em Angola. [**Incidence of Ankylostomiasis in Angola**] *Gaz. Méd. Portuguesa*. 1954, v. 7, No. 3, 531-2.

The English summary appended to the paper is as follows:—

"We had the opportunity between 1949 and 1951 to determine the incidence of ancylostomiasis among the natives of either sex and of all ages in the Chitato's district (Lunda, Angola).

"With a total of 5,264 fecal analyses (microscopic examinations of direct films), practically comprising the whole population of the above referred area, we found an infestation rate varying from 21 to 46%."

JONES, C. A. & ABADIE, S. H. **Studies in Human Strongyloidiasis. II. A Comparison of the Efficiency of Diagnosis by Examination of Feces and Duodenal Fluid.** *Amer. J. Clin. Path.* 1954, Oct., v. 24, No. 10, 1154-8, 1 fig.

It is known that the rhabditoid larvae of *Strongyloides stercoralis* can be demonstrated in the duodenal fluid of man. Less well known is the fact reported by the senior author (*Gastroenterology*, 1950, v. 16, 743), that these larvae can be demonstrated in the duodenal fluid when they are not demonstrable in faeces examined by the usual methods. In this paper the authors evaluate the relative efficiency of examinations of the duodenal fluid and the faeces.

Material was obtained from 193 ex-servicemen infected with *Strongyloides stercoralis*. A total of 1,874 stools from these patients were examined, an average of 9.7 per patient. Single stools were examined from 4 and 2-52 stools from the others. A total of 263 samples of duodenal fluid were obtained from 145 patients, but no stools of these were examined. From 144 patients both stools and duodenal fluid were examined. Stools were freshly passed and microscopic examination was made of one or more direct faecal films and of a film made after concentration with zinc sulphate. Duodenal intubation was done by Lyons's technique described by Bockus (*Gastroenterology*, Philadelphia: W. B. Saunders Co., 1946, v. 3, 471). No attempt was made to determine the position of the tip of the duodenal tube radiologically and unsuccessful attempts to introduce the tube were counted as failures. Gross flecks of mucus in the duodenal fluid were found to be the most fruitful material for microscopic study. Failing this, samples pipetted from the bottom of the container holding the fluid were examined.

Of the 1,874 stools examined, 522 (27 per cent.) contained recognizable larvae of *S. stercoralis*. Of the 263 specimens of duodenal fluid 180 (68 per cent.) contained identifiable larvae. These results do not vary significantly from those obtained earlier by Jones (*loc. cit.*) from fewer patients. They indicate that (a) more of the duodenal aspirates contained demonstrable larvae and (b) examination of the duodenal fluid is a better method of diagnosis. To test this view, however, an analysis was made of the success of examinations of both stools and duodenal fluid taken from 144 patients. From 86 of these both stools and duodenal fluid contained larvae. In 18 the duodenal fluid was negative, so that by examination of duodenal fluid alone the diagnosis of these would have been missed. In 40 patients larvae were not found in the stools, but were present in the duodenal fluid, so that by stool examination alone the diagnosis of these 40 would have been missed. Thus in 72 per cent. of the 144 patients the diagnosis could have been made by multiple stool examination alone, but 28 per cent. of the total infections would have been missed; and 88 per cent. could have been diagnosed by duodenal intubation alone, but 12 per cent. of the total infections would have been missed.

A graph shows that more diagnoses were made after a single duodenal intubation than by multiple stool examinations. The results show that duodenal intubation is the better diagnostic method and this, in the opinion of the authors, warrants the use of this more tedious method, which is probably better because the tip of the tube is at the point where the larvae

first reach the gut lumen. The results also show that neither method alone is as efficient as both together. A similar increased efficiency of diagnosis by duodenal intubation was reported by PRIETO and MULET, 1949 (*Med. Colonial*, 1949, v. 14, 375) and by SIMPSON [this *Bulletin*, 1939, v. 36, 844] and by WILLARD (*Gastroenterology*, 1946, v. 7, 650). G. Lapage

MOORE, M. P., Jr. **The Pathologic Aspects of Ascariasis.** *Southern Med. J.* 1954, Sept., v. 47, No. 9, 825-31, 7 figs. [20 refs.]

A short review of the life cycle of *Ascaris lumbricoides* is given and the points at which the worm is likely to give rise to pathological reaction in its host are considered. Six cases are reported.

The first two demonstrate the action of the worm on the lung. The first case was of a 6-year-old Negro who died shortly after admission to hospital and at autopsy was shown to have an extensive inflammatory reaction in the lungs with *Ascaris* larvae (*Ascaris* pneumonia), whereas the second was a case of a woman aged 37 who had suffered from a mild productive cough, pain in the chest, night sweats, a low irregular temperature, and blood-streaked sputum. An opacity was seen on X-ray examination and at operation a tumour 2.5 cm. by 3.0 cm. was removed from the apex of one lung. This was found to be an infarct caused by an *Ascaris* in the branch of the pulmonary artery supplying the area.

The next 3 cases show conditions that result from the migration of worms in the intestinal tract. Of these the first case was that of a woman with symptoms of appendicitis; a worm was found in the lumen of the appendix. [The data presented do not convince the abstracter that the presence of the worm was not coincidental or that the woman had appendicitis.] The second case was that of a child brought in dead. The history was that in the preceding 30 hours the child had had attacks of severe abdominal pain and vomiting with symptom-free intervals. At autopsy, 330 worms were found in the gastro-intestinal tract, most of which were in the stomach, duodenum and first part of the jejunum. Others were found in the pleural cavities; 3 perforations were found in the oesophagus. There was peritonitis with free serosanguineous fluid. Two round worms were found blocking the pancreatic duct and another in the tail of the pancreas. The third case was that of a 13-year-old coloured boy who died shortly after taking a "red vermifuge". At autopsy in "the anterior wall of the cardiac portion of the stomach there was an irregular 5 cm. thinned area in the centre of which there were two 5-mm. perforations". A live *Ascaris* was found in the peritoneum, with much fluid and gas. Four more *Ascaris* were found in the lumen of the intestinal tract.

The last case reported was that of a 4-year-old coloured boy who had vomited worms and had received a vermifuge; he was admitted with symptoms suggestive of peritonitis. He was given an antibiotic and later hexylresorcinol and passed 3 worms. He continued to have attacks of intestinal obstruction and eventually the abdomen was opened. No free fluid was found but numerous intestinal adhesions and greyish white nodules were observed in the serous surface. Some of these were removed, and the child subsequently made good progress. The nodules were found to contain ovoid bodies surrounded by granulomatous inflammation and appeared to be *Ascaris* eggs. It is considered that they had escaped from the intestinal canal through a minute, temporary perforation with other intestinal contents; a subacute peritonitis had followed but had subsided. Meanwhile the ova had caused a granulomatous reaction in the serosa with which they were in contact.

L. E. Napier

BERNING, H. Dünndarmverschluss durch Ascaridenknäuel bei einem zwei-jährigen Kind. [**Obstruction of the Small Intestine by a Mass of *Ascaris* in a Child of 2 Years**] *Med. Klin.* 1954, Dec. 3, v. 49, No. 49, 1954, 1959, 3 figs. [11 refs.]

GOODWIN, L. G. & STANDEN, O. D. **Treatment of Roundworm with Piperazine Citrate ("Antepar")**. *Brit. Med. J.* 1954, Dec. 4, 1332-3.

The authors refer to literature on the use of piperazine for the treatment of ascariasis, most of which has already been abstracted in this *Bulletin*. They tried, in the neighbourhood of Kasulu, Tanganyika, a single-dose treatment with tablets containing piperazine citrate, each tablet being equivalent to 0.5 gm. of piperazine hydrate. The tablets were swallowed with water; no purge was given before treatment and no restrictions of diet or alcohol were imposed. Most patients were given magnesium sulphate 24 hours after the dose of piperazine, whether they passed worms or not. Only patients showing numerous *Ascaris* eggs in their stools were treated, these eggs having been found by direct stool examination.

Preliminary tests made on patients in hospital showed that a single dose of 3-4 gm. for an adult yielded a large crop of worms in the stools about 24 hours after the piperazine had been given. One child, aged 4 years, produced 14 male and 37 female *Ascaris* after a dose of 2 gm. and an infant given 1 gm. passed worms, but eggs of *Ascaris* were present in the stools a week later. Toxic effects were not observed.

When 118 schoolchildren, aged 8-14 years, were examined, 39 showed numerous *Ascaris* eggs in the stools and these 39 were treated, children weighing more than 50 kgm. being given 3 gm., those weighing 30-50 kgm. 2.5 gm. and smaller children 2 gm. Of the 37 children who brought a stool for examination after treatment, one given 3 gm., 19 out of 26 given 2.5 gm. and 7 out of 10 given 2 gm. were free from eggs. It was concluded that the dosage was not sufficient.

At Kabanga hospital a group of 37 adults and children were given 3 or 2 gm. of piperazine irrespective of their body weight and no toxic effects were seen, although some of the children were given 3 gm. Of the 9 who had had 3 gm., all had no eggs in the stools 5 days after the dose, except one woman with a heavy worm-load. Of 19 patients who had 2 gm., 12 were freed from eggs. One child, aged 1½, given 1 gm., was free from eggs 5 days later.

At the village of Heru Juu adults were given 3 gm. and children 2.5 or 2 gm. The patients brought back 1-200 worms after dosage, the biggest yield being 2 male and 15 female adult worms and more than 200 immature ones produced by a child aged 2, who had had 2 gm. of piperazine. Yields of 15-20 adult worms were common. It was not possible to follow up these patients. There was no evidence that piperazine had any action on hookworms or on *Strongyloides stercoralis* present in the patients treated.

The authors conclude that piperazine citrate (Antepar) was effective in a single dose and produced no toxic effects, and that the results suggest that all patients except children weighing less than 20 kgm. should be given 3 gm. and smaller children 2 gm.; but, as WHITE and STANDEN [this *Bulletin*, 1954, v. 51, 86] showed, when piperazine salts are given for 7 days, as they should be given for *Enterobius* infections, care must be taken that the tolerated dose is not exceeded.

Standen [unpublished] has shown that pig *Ascaris* in Ringer's solution containing 1 in 500 or more of piperazine citrate became slowly immobilized in 16-18 hours, but were not killed and that worms passed 24 hours after

treatment recovered in a few hours in Ringer's solution at 37°C. This immobilization in the gut is likely to lessen the risk of occlusion or perforation of the gut during treatment of heavy infections in small children; but, if the patient is constipated, the effect of the drug may pass off before the worms are expelled and in such cases a purge seems to be necessary, although most of the patients treated in Kasulu passed worms without one. The authors suggest a dose of piperazine before the evening meal and a saline purge before breakfast next morning. It is not known whether the drug acts on the larvae of *Ascaris* in the tissues. If it does not, these larvae might provide worms about 8 weeks after elimination of adult worms from the gut. When whole populations are to be treated, monthly doses for at least 4 months would be advisable, because *Ascaris* eggs can survive for several months, so that re-infections are readily possible. *G. Lapage*

BROWN, H. W. **The Treatment of *Ascaris lumbricoides* Infections with Piperazine.** *J. Pediatrics*. St. Louis. 1954, Oct., v. 45, No. 4, 419-24. [15 refs.]

The treatment of *Ascaris lumbricoides* infection by an emulsion of piperazine citrate was undertaken in 51 schoolchildren. The daily dosage given was 5 ml., divided into 2 doses for children of 15 to 30 lb., 10 ml. for children of 31 to 60 lb., and 20 ml. for children of 61 lb. or over, for 2 to 5 days; 1 ml. contained an equivalent of 100 mgm. of piperazine hexahydrate. The doses were given at 8.30 a.m. and 3.30 p.m.; no purgatives were given and no dietary restrictions observed.

Of the 51 children treated 46 were completely cured; in 3 the post-treatment egg counts were reduced materially and in 1 insignificantly; and in 1 the egg count was increased. There was no significant correlation between the cures and either the initial egg count or the number of days of administration, although all 8 children receiving 5 days' treatment were cured and 2 of the 13 receiving 2 days' treatment relapsed; 2 of the other 3 failures were among those receiving 4 days' treatment.

No ill effects of treatment were observed.

L. E. Napier

JACHOWSKI, L. A., Jr. **Filariasis in American Samoa. V. Bionomics of the Principal Vector, *Aedes polynesiensis* Marks.** *Amer. J. Hyg.* 1954, Sept., v. 60, No. 2, 186-203, 4 figs. [17 refs.]

Aedes polynesiensis is the principal or sole vector of non-periodic bancroftian filariasis and a potential vector of dengue in its distribution area which comprises Samoa, Fiji, Wallis Island, Cook Islands, Society Islands, Marquesas Islands, Ellice Islands and the Tuamotu Islands in the South Pacific. This paper reports field studies on this species in American Samoa where adults and larvae were taken in all localities, from sea level to mountain, where breeding and adult resting places were available. Systematic catches of adults on men acting as bait for 10 minutes in every hour throughout 24 hours in a village house, in the central clearing of a village 25 yards from any house, and in a path through a banana grove 50 yards from any house, revealed that many more mosquitoes were taken in the banana grove than in the village clearing or inside the house. The lowest catches of all were in the central village clearing. Both in the clearing and, particularly, in the bush site among the banana plants there was a marked peak of biting activity in the afternoon (3 to 6 p.m.) and a lower peak in the morning (6 to 9 a.m.). Catches in the darkness of the night are thought to be due to activation of the mosquitoes by torch light and,

latterly, night catches were discontinued as invalid on this account. Indoor catches tended towards a single peak in the afternoon. Other experiments of a similar pattern confirmed the preponderance of adults in the bush rather than in villages and houses.

Experiments on the range of dispersal, with coloured powder-dyes (gentian violet, eosin and methyl green) to mark adults released from known points, confirmed the view generally stated that dispersal of *A. polynesiensis* is limited, not exceeding about 100 yards even over 2 or 3 weeks. Clearings—main roads and airstrips—are barriers.

Seasonal fluctuation in mosquito density is not appreciable in Samoa although this is apparent in Fiji and Raratonga. Bright sun, strong winds, and rain tend to deter activity in clearings but not in the protection of bush vegetation.

Isolated pairs of mosquitoes kept in the laboratory at 80°F. and high humidity gave a mean survival for females of 21·2 days, the maximum being 56 days. This survival value is consistent with the times of 12 to 20 days required for the full development of the filarial parasite in the mosquitoes.

A. polynesiensis was never found resting in indigenous or European houses in Samoa but it was frequently seen on the underside of leaves of bushes sheltering breeding containers (small natural and artificial collections of water, very commonly coconut shells) and in cracks in stone walls built to confine pigs. Although there is clear evidence that the females will feed on pigs, horses, chickens and dogs (all stages of *Dirofilaria immitis* were found in dissections of the mosquitoes), man is the preferred host. The bite is not usually painful. The mosquitoes are tenacious once feeding has begun and take up 1·3 to 2·8 mgm. of blood (mean = 2·1 mgm.) in 2 or 3 minutes. Laboratory observations indicate that a blood meal is taken about the third day of life and thereafter at weekly intervals.

Males occur at or near breeding places and also near the host, and may attempt to copulate with an engorging female. A female lays about 55 eggs after its first blood meal; it is not autogenous. Males emerged 9 days and females 9·4 days after the eggs had hatched, larval life lasting 6·9 days and the pupal stage 2·1 and 2·4 days for the male and female respectively.

The method used for maintaining a strain of *A. polynesiensis* in America, starting with 4-day-old eggs from Samoa dried for about 70 days, is described in detail.

D. S. Bertram

CHATTERJI, K. C. **Adult *Filaria (bancrofti)* in the Anterior Chamber of Human Eye.** *J. Indian Med. Ass.* 1954, Nov. 16, v. 24, No. 4, 146-7, 1 fig. on pl.

Report of a case.

BARTON, W. L. ***Filaria bancrofti* as a Cause of Haematuria.** *East African Med. J.* 1954, Oct., v. 31, No. 10, 477-8.

The author from Kilifi, Kenya, records 3 cases in which microfilariae of *W. bancrofti* were found in the urine of patients with frank haematuria, but without lymphuria. In each case, microfilariae were subsequently found in the blood. The parasites disappeared and the urine cleared up rapidly after treatment with diethylcarbamazine. In 2 of the patients, ova of *S. haematobium* were subsequently found in the urine, but only after the haematuria had cleared with treatment of the filariasis.

H. J. O'D. Burke-Gaffney

RAJAGOPALAN, N., VEDAMANICKAM, J. C. & RAGHUPATHI RAMANI, S. **Development of Resistance to B.H.C. by *C. fatigans* in the Course of a Larva Control Programme.** [Research Notes.] *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1954, Nov., v. 2, No. 6, 211-13.

A strain of *Culex fatigans* with adults abnormally resistant to DDT was described by RAJINDAR PAL *et al.* [this *Bulletin*, 1954, v. 51, 319] from a village regularly sprayed with DDT. In this note the authors report the first instance of abnormal resistance to BHC by larvae of *C. fatigans*. This resistance was developed in the district of Kumbakonam (South India) as a result of 20 months' larvicidal use of gamma BHC wettable powder as a culicine larvicide to reduce filariasis. At the end of this time, the larvae required 6 times the original dose for a 98 per cent. mortality.

This change was confirmed by laboratory tests with larvae from Kumbakonam in comparison with those from an untreated area. The resistant larvae appeared to be also tolerant of DDT and dieldrin but on being reared for 2 generations in the absence of insecticide, the resistance seemed to be lost.

J. R. Busvine

JUNG, R. C. **Use of a Hexylresorcinol Tablet in the Enema Treatment of Whipworm Infection.** *Amer. J. Trop. Med. & Hyg.* 1954, Sept., v. 3, No. 5, 918-21.

The author refers to literature on the importance of infections with whipworms (*Trichuris trichiura*) in some parts of the world. Oral medication for these infections has been found to be generally ineffective, but JUNG and BEAVER (*Pediatrics*, 1951, v. 8, 548) and BASNUEVO *et al.* (*Ztschr. f. Tropenmed. u. Parasitol.*, 1952, v. 3, 371) have established the efficacy of the 0.2 per cent. hexylresorcinol retention enema as a means of reducing the infections to a subclinical level [see also this *Bulletin*, 1952, v. 49, 429, 638, 639]. The enemas can now be readily prepared by dropping 2 tablets each containing 0.4 gm. of hexylresorcinol into 400 cc. of distilled water and shaking vigorously. Before the enema is given the bowel is cleansed by several normal saline enemas. The buttocks, thighs and perineum are then covered with a protective coating of petroleum jelly, because spilled enema may cause second-degree burns. The enema is then instilled slowly to fill the large intestine as far as the caecum. In the average patient aged 2-4 years this requires up to 500 cc. The patient is encouraged to retain the enema for 30 minutes, the buttocks being taped or held together if necessary. If the enema has not been returned after 1 hour, a small tapwater enema is given. Proctoscopy has shown that the enemas do not damage the mucosa of the gut, which is protected, the author suggests, by the coating of mucus on it.

The author has treated 22 patients, who were male and female, coloured and white, children, with enemas of this kind, stool and egg counts being done before and after treatment. A table shows the results obtained. Although the enemas lowered the worm burden in most of the cases, clinical improvement, when it occurred, was not ascribed to this, but to treatment of basic diseases suffered by the patients. Thus 16 patients had "heavy, dysenteric" infections and the stools of all of them showed more than 100 eggs of *Trichuris trichiura* per mgm. of faeces. Another table shows the effects of the enemas on the worms in these patients. In 12 the egg counts decreased by some 80 to 90 per cent. and in 1 case the infection was apparently eradicated. In 4 out of 5 cases in which proctoscopy was repeated after treatment the worms had been eradicated from the part of

the bowel seen and in all these 5 patients the appearance of the bowel had strikingly improved. In all the heavily infected patients there was marked symptomatic improvement within 2 days after treatment. In 2 patients 2 enemas were required to produce the above results. In 5 of the heavily infected patients there was a co-existing infection with *Entamoeba histolytica* and Jung and Beaver (*loc. cit.*) have pointed out the predisposition of patients infected with whipworms to amoebiasis. Enemas made with hexylresorcinol powder gave results as good as those made with tablets, but with the tablets enemas are more easily prepared. The author regards the hexylresorcinol enema as the treatment of choice in heavy infections, oral medication being so disappointing. [See also MACCARTHY, (*this Bulletin*, 1954, v. 51, 623) on the treatment of whipworm infections with papain.]

G. Lapage

MOCHMANN, H. Zum fluoreszenzmikroskopischen Nachweis von Wurmeiern. [**Demonstration of Worm Eggs by Fluorescence Microscopy**] *Zent. f. Bakt. I. Abt. Orig.* 1954, v. 161, No. 6, 416-18, 8 figs.

Worm eggs have so far been studied by fluorescence microscopy only, so far as the author knows, by RANKL (*Zent. f. Bakt.*, 1947-48, v. 152, 152), who noted that oxyurid eggs in dried smears treated with 1 per cent. auramine and 20 per cent. solution of extract of acridine-yellow, or after staining with 1 per cent. berberine sulphate solution, shine out in the fluorescence microscope like yellow "signal lights". Rankl found, however, that ascarid eggs showed fluorescence only after a complicated staining process. He treated ascarid eggs first for 15 minutes with acid alcohol and then stained them with heated 1 per cent. berberine sulphate and finally, to remove fluorescence from other particles in the preparation, treated the eggs briefly with methylene blue. He then obtained fluorescent ascarid eggs, but concluded that they have no fluorescence of their own.

Mochmann, however, has found that both oxyurid eggs, taken from anal smears, and ascarid eggs, taken from a stool, show, even in untreated preparations, a yellowish-green fluorescence of their own. Photographs illustrate this. The fluorescence of ascarid eggs can be seen in permanent stool preparations made in the glycerin-gelatin of Haitinger (*Die Fluoreszenzmikroskopie in ihrer Anwendung auf Chemie und Mikroskopie*. Leipzig, 1938), but the fluorescence possessed by ascarid eggs is somewhat lost against the background of this glycerin-gelatin.

The paper is illustrated by 8 photographs taken with the ordinary microscope, the phase-contrast microscope and the fluorescence microscope. The author points out that the ordinary and the phase-contrast microscopes show more structural detail in the eggs, although with the fluorescence microscope ascarid and oxyurid eggs are readily distinguished from one another and on the dark background they are less easily overlooked; this technique will expedite examination.

G. Lapage

DEFICIENCY DISEASES

GRUSIN, H. & KINCAID-SMITH, P. S. Scurvy in Adult Africans. A Clinical, Haematological, and Pathological Study. *Amer. J. Clin. Nutrition.* 1954, Sept.-Oct., v. 2, No. 5, 323-35, 7 figs. [20 refs.]

This paper describes 30 cases of scurvy among the Bantu urban population of Johannesburg. The disease arises sporadically among persons living

mainly on maize porridge and small quantities of meat and vegetables. This is a good account of the disease for those who are not familiar with it, but the reader with experience will find nothing new. [The authors state: "For the first 3-7 days while preliminary studies were made, they received no specific treatment unless their clinical condition warranted it". It should be widely known that sudden collapse and death is not uncommon in scurvy. Indeed in this series "one patient suddenly collapsed and died 24 hours after admission before ascorbic acid had been administered". Any patient with scurvy has a clinical condition which warrants specific therapy immediately. This paper is only one of many in the literature of scurvy, in which the giving of the essential remedy has been withheld pending investigations which were not of urgent importance for the treatment of the patient.]

R. Passmore

WALKER, A. R. P. & ARVIDSSON, U. B. **Studies on Human Bone from South African Bantu Subjects. I. Chemical Composition of Ribs from Subjects habituated to a Diet Low in Calcium.** *Metabolism*. New York. 1954, Sept., v. 3, No. 5, 385-91. [37 refs.]

HIGGINSON, J. **II. Histopathological Changes in the Ribs of South African Bantu Infants.** *Ibid.*, 392-9, 6 figs.

I. The first paper records the results of analyses for ash, calcium and potash of the ribs of persons dying of disease or trauma in Johannesburg. The percentages of calcium in dry defatted bone were:

29 Bantu infants (non-rachitic)	...	...	22.7
12 Bantu infants (mild rickets)	...	...	21.7
3 Bantu infants (severe rickets)	...	...	20.5
12 Bantu infants (kwashiorkor)	...	...	22.9
18 European infants	...	...	22.2
12 Bantu adults	...	...	22.5
22 European adults	...	...	22.0

Although the dietary intake of calcium in Bantu at all ages is low, judged by European standards, this does not appear to interfere with the mineralization of bone. The low calcium content of the bone found in infants (mainly breast-fed) dying with rickets was judged to arise mainly from inadequate intake of vitamin D and insufficient exposure to sunlight.

II. The second paper is a histological study of the same material. The very beautiful photomicrographs show clearly that, although bone composition may be normal, bone growth may be impaired. Especially in kwashiorkor there was marked depression of growth. The histological evidence of rickets could be found in 25 per cent. of the infants: it is a common disease among urban Bantu children.

R. Passmore

HAEMATOLOGY

GAVRILSKI, G. & TADŽER, I. S. **On Macrocytary Anemia occurring during Pregnancy with special regard to its Pathogenesis.** *Acta Med. Iugoslavica*. 1951, v. 5, Nos. 1/2, 128-37. [39 refs.]

The macrocytic anaemia of pregnancy is usually considered to be due to dietary deficiencies, particularly a low protein intake. The authors

examined 65 cases of this condition in Macedonia from 1946 to 1950 and in their opinion the most important cause was hypersplenism connected with malaria. Their criteria for hypersplenism were: (1) an enlarged spleen, (2) low red cell count and neutropenia with relative lymphocytosis, (3) a demonstration of over-activity of the spleen by the injection of adrenaline: within 5 minutes the spleen contracted and the leucocyte count rose with the red cell count remaining stationary, (4) a demonstration of marrow hyperplasia with erythropoiesis showing numerous young macroblasts. With the increasing success of the anti-malarial campaign in Macedonia the hypersplenism is found more rarely and hence the macrocytic anaemia of pregnancy is less often seen in that part of the world. *H. Lehmann*

See also p. 293, BHENDE, **A Note on Anemia in Epidemic Dropsy.**

NUYKEN, G. Thalassämie in Iran. [**Thalassaemia in Persia**] *Med. Klin.* 1954, Dec. 3, v. 49, No. 49, 1955-6.

The author has examined 200 out-patients in Northern Persia and has found 75 of them to show the picture of thalassaemia; 2 of them were almost certainly cases of thalassaemia major, 42 of thalassaemia minor and 31 of thalassaemia minima. Target cells, fragmented cells together with anisocytosis and poikilocytosis, raised resistance of erythrocytes against hypotonic salt solutions, failure of iron therapy and familial distribution, were considered characteristic manifestations. In 14 cases the abnormality could be shown to exist in other members of the family. The author remarks on the rarity in his series of homozygotes suffering from thalassaemia major; he explains this by the early death of these patients.

The region in which the investigations were carried out was East of the Caspian Sea. Of the patients 121 were Persians from the provinces of Gurgan and Khurasan who have mixed a great deal with the Turks; others were of purer stock and were inhabitants of Turkmenia (71) and Baluchistan (8). The incidence in these three groups of out-patients was 43 (35 per cent.), 29 (41 per cent.) and 3 respectively. *H. Lehmann*

SINGER, K., KRAUS, A. P., SINGER, Lily, RUBINSTEIN, H. M. & GOLDBERG, S. R. **Studies on Abnormal Hemoglobins. X. A New Syndrome: Hemoglobin C-Thalassemia Disease.** *Blood.* 1954, Nov., v. 9, No. 11, 1032-46, 5 figs. [37 refs.]

"1. A Negro family is described in which several individuals exhibit either the manifestations of thalassemia, or of the uncomplicated hemoglobin C trait; in two members the combined occurrence of these two anomalies is demonstrable. This combination is designated as hemoglobin C-thalassemia disease.

"2. Hemoglobin C-thalassemia disease manifests itself in these two patients as a microcytic erythrocytosis. The red cells reveal a low MCV and low MCH, but a normal MCHC. About 45 per cent of the erythrocytes appear as target cells in the film. The amount of hemoglobin C in the hemolysates was about 75 per cent, the remainder being composed of A hemoglobin, and in one instance also of a small quantity of F hemoglobin. This is analogous to the results of the hemoglobin analyses in sickle cell-thalassemia disease, where 60 to 80 per cent of the pathologic hemoglobin S are found, though these individuals are heterozygous for both the pathologic hemoglobin and the thalassemia genes. The hypothesis is advanced that

the thalassemia gene modifies (enhances) the expressivity of the gene for the pathologic pigment.

"3. In genetic studies of families with thalassemia, hemoglobin analyses represent a necessary requirement. It is now established that thalassemia, as well as disorders associated with hemoglobin C, reveals a tendency to leptocytosis and thus may show erythrocytes with increased osmotic resistance.

"4. The segregation of the thalassemia gene and of the genes for pathologic hemoglobins take place independently of each other. These genes are not allelomorphs."

SINGER, K., CHAPMAN, A. Z., GOLDBERG, S. R., RUBINSTEIN, H. M. & ROSENBLUM, S. A. **Studies on Abnormal Hemoglobins. IX. Pure (Homozygous) Hemoglobin C Disease.** *Blood*. 1954, Nov., v. 9, No. 11, 1023-31, 4 figs. [21 refs.]

"Four Negro patients with pure (homozygous) hemoglobin C disease are described, who exhibited the characteristic features of, (1) a hemolytic process with or without anemia, (2) splenomegaly, and (3) numerous target cells in the film. The method of choice to establish the diagnosis objectively is paper electrophoresis of the stroma-free hemolysate, prepared from the patient's erythrocytes. No alkali resistant (F) hemoglobin was found in this syndrome (homozygous for hemoglobin C) in contradistinction to sickle cell anemia (homozygous for hemoglobin S) where F hemoglobin is usually present. Splenectomy did not ameliorate the hemolytic process."

ZUELZER, W. W. & KAPLAN, E. **Thalassemia-Hemoglobin C Disease. A New Syndrome presumably due to the Combination of the Genes for Thalassemia and Hemoglobin C.** *Blood*. 1954, Nov., v. 9, No. 11, 1047-54, 7 figs. [13 refs.]

"An unusual type of severe chronic hypochromic microcytic anemia in a Negro is described and attributed to the interaction of the hemoglobin C gene with the thalassemia gene. The patient and his father were shown to be carriers of the C trait, the mother and several siblings of the thalassemia gene."

VANDEPITTE, J. Aspects quantitatifs et génétiques de la sicklanémie à Léopoldville. [**Quantitative and Genetic Aspects of Sickle-Cell Anaemia in Léopoldville**] *Ann. Soc. Belge de Méd. Trop.* 1954, Aug. 31, v. 34, No. 4, 501-16, 1 text fig. & 2 figs. on 2 pls. [23 refs.]

The author has investigated sickle-cell anaemia in Léopoldville for some years and this paper summarizes his experiences. In a population with an incidence of the sickle-cell phenomenon at 20 per cent. frequency about 1 per cent. of them should be homozygotes and if the theory that the homozygous sickle-cell gene causes sickle-cell anaemia is correct there should be 1 per cent. of persons with sickle-cell anaemia in such a population. If this were so sickle-cell anaemia should be a frequent disorder and indeed in the course of two years no less than 261 such patients were observed in Léopoldville. In addition to the older diagnostic criteria, some were investigated by filter paper electrophoresis and in as many cases as possible the parents were also examined.

In the majority of individuals the age could be determined and only few were found to be older than 10 years (10 out of 244). The oldest patient seen was a pregnant woman of 25. When the parents of children with sickle-cell anaemia were examined nearly all of them were found to show the sickle-cell gene. Of 233 mothers the sickle-cell trait was found in 231, but in 2 it was found to be absent. Of 206 fathers examined 16 showed a negative result. Of these 10 could be excluded on grounds of non-paternity but in 6 of them such exclusion was impossible. The mothers who showed no sickle cells were specially examined for other abnormal haemoglobins and C, D and F were excluded. Unless the children were adopted, a possibility for which the examination of the blood groups gave no support and against which physical resemblance to the mother militated, a mutation had to be assumed. Nevertheless the number of mutations is much too low to allow the assumption that they could explain the survival of an otherwise disadvantageous gene. The high frequency of sickle-cell anaemia with the high frequency of the sickle-cell gene, together with the low mutation rate, all give indirect support for the assumption of a positive selective advantage of the sickle-cell gene.

Attached to the paper are two beautiful photomicrographs, one illustrating filamentous sickling in sickle-cell anaemia and the other haemoglobin debris found in the bone-marrow of sickle-cell anaemia patients, a phenomenon to which the author was the first to draw attention.

H. Lehmann

RAPER, A. B. **Simple Principles in the Haematological Diagnosis of Sickle Cell Anaemia.** *East African Med. J.* 1954, Oct., v. 31, No. 10, 443-9. [13 refs.]

Both in malaria and in sickle-cell anaemia (SCA) the blood picture is one of regeneration and peripheral haemolysis. This paper discusses how, with the increase in knowledge of the blood picture in SCA, a stage has now been reached where confidence may safely be placed in some simple laboratory tests. No single test establishes or excludes the diagnosis nor can all laboratory tests themselves suffice without the clinical diagnosis which is complementary. A haemolytic anaemia must be present and it must be possible to account for it by intensity of sickling. Such an anaemia would not be expected during the first 4 to 6 months of life as whatever the final composition of a person's haemoglobin, sufficient foetal haemoglobin will be present in earliest infancy to prevent intense sickling.

A thick blood film stained with Field's stain will show whether the red cells are normal, in which case they will all be haemolysed, or whether they are polychromatic as in the regeneration stage of haemolytic anaemia. If the second is the case a fine dust of basophilic material appears which on staining with methylene blue is seen as ghosts of cells and is a very sensitive index of regeneration. Scarcity or absence of malarial parasites, however, will not exclude malaria because the picture of regeneration becomes most pronounced in the period of recovery when parasites are scanty. However, an increased proportion of white cells, particularly of young granulocytes, is suggestive of SCA. In the author's opinion a leuco-erythroblastic rather than a mere erythroblastic condition differentiates SCA from malaria. This particular feature will, of course, be recognized even more distinctly in a thin film. To estimate intensity of sickling the author recommends incubation of the blood with bacteria or chemicals rather than prolonged incubation by itself. Incubation of untreated blood will produce a reduction of

haemoglobin but whether this reduction is complete will depend on the individual sample, its content of white cells, etc.

The fundamental difference between SCA and sickle-cell trait (SCT) is not so much the appearance of the filamentary type of sickling, which can be seen in both conditions, but an unequal sickling picture. Whereas in SCT sickling is uniform throughout the preparation, in SCA there will be as well as the long filaments quite a considerable proportion of normal unsickled cells and many of holly-leaf or crescentic form. Thus incomplete and polymorphic sickling is characteristic of the anaemia rather than of the trait because it probably depends on the presence of a red cell population very unevenly mixed in age.

H. Lehmann

DOENGES, J. P., SMITH, E. W., WISE, S. P. & BREITENBUCHER, R. B.
Splenic Infarction following Air Travel and associated with the Sickling Phenomenon. *J. Amer. Med. Ass.* 1954, Nov. 6, v. 156, No. 10, 955-7.

"In two patients the diagnosis of sickle-cell hemoglobin C disease was proved by electrophoretic studies of the hemoglobin; in one of these the clinical impression was also substantiated by the presence of target cells in the peripheral blood. The symptom complex of both these patients closely parallels the triad of splenic infarction, sicklemia, and high-altitude flying that has been previously described in the literature. We feel that a process other than sicklemia may be involved in cases such as those reported and that the basic concept of the triad may include sickle cell-hemoglobin C disease rather than sicklemia." [See also this *Bulletin*, 1954, v. 51, 509.]

LEAVELL, B. S. **Treatment of Sickle Cell Anemia.** *Arch. Intern. Med.* 1954, Nov., v. 94, No. 5, 801-5. [34 refs.]

Sickle-cell anaemia was described first in 1910 and this was followed by the discovery of the symptomless sickle-cell trait present in about 9 per cent. of American Negroes, whereas sickle-cell anaemia is found in about 2 per 1000. Besides the sickling property of the erythrocytes and the presence of anaemia probably the most characteristic feature of sickle-cell anaemia is the occurrence of sudden attacks of pain in almost any part of the body. These episodes appear to be explained by the capillary engorgement and areas of infarction that are found in the various organs at autopsy. Some areas of infarction seen at autopsy are not accompanied by demonstrable thrombosis and it has been postulated that vasospasm rather than thrombosis is responsible for the infarcts. These observations suggest that a reduction of oxygen tension sufficient to produce sickling and increased viscosity may occur *in vivo* in sickle-cell anaemia and cause the vascular catastrophes.

Opinions on therapy sometimes differ as to the measures that should be employed, a difference probably due in large part to the difficulty of evaluating non-specific treatment in a disease whose clinical course varies as widely as does that of sickle-cell anaemia. Transfusions are widely used; not only do they correct the anaemia but they also suppress haemopoiesis and production of sickle cells. As a result a patient's blood can be rendered essentially normal for a period of at least several weeks by the use of multiple transfusions. The rôle of splenectomy in the disease still remains controversial. Splenectomy certainly does not affect the sickling

phenomenon and what can only be described as an "autosplenectomy" has been found at autopsy in some patients who had suffered from a severe form of the disease. Thus the procedure can only be beneficial in children and adults whose spleens are moderately or greatly enlarged. There seems to be agreement that most of the patients whose spleens extend to the umbilicus or below are greatly benefited by splenectomy.

The anaemia itself rarely responds to anything but transfusions. Treatment with vitamin B12 and liver extracts is ineffective. Iron is contra-indicated. The effect of corticotrophin has been described both as helpful and as dangerous. Some reported a rise of erythrocytes to normal level, others found that crises were precipitated. Crises often follow infection or fever and for this reason infection should be searched for in various parts of the body and should be treated. Recently benzazoline (Priscoline) has been reported as giving dramatic relief of pain in 7 children with sickle-cell anaemia [this *Bulletin*, 1954, v. 51, 975].

H. Lehmann

EPIDEMIC DROPSY

BHENDE, Y. M. **A Note on Anemia in Epidemic Dropsy.** *Indian J. Med. Sci.* 1954, Oct., v. 8, No. 10, 671-5. [11 refs.]

In 1953 there was an outbreak of epidemic dropsy in Nadiad, a place about 30 miles from Ahmedabad. Ten patients were especially examined; they had well-developed oedema and had been ill for at least three weeks. If a haemoglobin of 12 gm. per cent. is regarded as the lower limit of normality, 9 of them had to be considered anaemic although only 4 of them had less than 9.6 gm. per cent. and only one less than 7 gm. per cent. The reticulocyte count was within normal limits in all patients except one. The Van den Bergh reaction was negative and the icteric index normal in all. There was no increase in urinary urobilinogen. The observations suggest that the anaemia of epidemic dropsy, if present at all, is not haemolytic. SEN GUPTA and NAPIER [this *Bulletin*, 1941, v. 38, 289] have suggested that the anaemia is due to depressed erythropoiesis caused by the toxic action on the marrow of argemone oil. The present findings support this theory.

H. Lehmann

VENOMS AND ANTIVENENES

GRASSMANN, W. & HANNIG, K. Elektrophoretische Untersuchungen an Schlangen- und Insektentoxinen. [**Electrophoretic Studies on Snake and Insect Toxins**] *Hoppe-Seyler's Ztschr. physiol. Chem.* 1954, v. 296, Nos. 1/2, 30-44, 8 figs. [Refs. in footnotes.]

The authors report at some length results of electrophoretic studies of the toxins of several species of snakes and of bee venom. The results are shown in curves and photographic illustrations, which should be studied in the original.

H. J. O'D. Burke-Gaffney

DUTTA, N. K. & NARAYANAN, K. G. A. **Release of Histamine from Skeletal Muscle by Snake Venoms.** *Brit. J. Pharmacol. & Chemotherapy.* 1954, Dec., v. 9, No. 4, 408-12, 3 figs. [22 refs.]

"1. The venoms of cobra (*Naja naja*), krait (*Bungarus coeruleus*) and saw-scaled viper (*Echis carinata*) liberate histamine from the isolated rat diaphragm, cobra venom being the most active and saw-scaled viper venom the least active in this respect.

"2. The release of histamine by cobra venom is explosive in character, as 50 to 60% of the histamine content of the muscle is set free during the first ten minutes.

"3. Antihistamine drugs did not reduce the toxic effects of cobra venom on rats and guinea-pigs, the survival period being not significantly altered when envenomed animals were treated with antazoline, tripeleennamine or promethazine."

BÜCHERL, W. Dosagem comparada da atividade dos extratos glandulares e do veneno puro de *Phoneutria nigriventer* (Keyserling), 1891. [**Comparative Estimation of the Activity of Glandular Extracts and of Pure Venom of the Spider *Phoneutria nigriventer***] *Mem. Inst. Butantan.* 1953, v. 25, No. 2, 1-21. [10 refs.] English summary.

TANGE, Y. Beitrag zur Kenntnis der Morphologie des Giftapparats bei den japanischen Fischen, nebst Bemerkungen über dessen Giftigkeit. VI. Über den Giftapparat bei *Erosa erosa* (Langsdorf). [**Morphology of the Poison Apparatus of Japanese Fish with Observations on their Toxicity.** VI. **Poison Apparatus of *Erosa erosa***] *Yokohama Med. Bull.* 1954, Apr., v. 5, No. 2, 118-24, 3 figs. [14 refs.]

TOXOPLASMOSIS

AWAD, F. I. **A New Dye Test for *Toxoplasma* and *Sarcocystis* Infections by use of *Sarcocystis tenella* Spores.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, July, v. 48, No. 4, 337-41.

The author describes a modified Sabin-Feldman dye test in which *Sarcocystis* spores are substituted for toxoplasms and used for the diagnosis of both sarcosporidiosis and toxoplasmosis.

For the tests, saline suspensions of *Sarcocystis* spores were prepared from sporocysts excised from sheep gullets, and the sera were obtained from sheep and guineapigs experimentally infected with *Sarcocystis* and *Toxoplasma* respectively. In one set of experiments sarcosporidial spores were tested with the sera of sheep and rabbits, as well as of a man, infected with *Sarcocystis*: the results were positive in all cases, except in one sheep in which the infection was not confirmed parasitologically. In another set of experiments sarcosporidial spores were tested with sera of human beings with suspected toxoplasmic infection and with those of guineapigs infected with *Toxoplasma*: the results were positive in the case of all the rodents and in 3 out of 6 human subjects, whose sera reacted similarly to the

control test with *Toxoplasma*. Like the toxoplasms, the sarcosporidial spores become rounded when stained with methylene blue, but retain their banana-shape when unstained.

Thus, the "cytoplasm-modified antibody" produced by *Toxoplasma* reacts with *Sarcocystis* spores, which can be used for diagnosis of both toxoplasmosis and sarcosporidiosis. The use of the spores for the dye test has the following advantages: they are larger than the toxoplasms, therefore easier to count; the number of them obtainable from sarcocysts is greater than that of toxoplasms obtainable from peritoneal exudate; and, not being pathogenic, they are safer to handle.

C. A. Hoare

WILDFÜHR, G. Tierexperimentelle Untersuchungen zur Frage der diaplazentaren Übertragung der Toxoplasmen beim vor der Gravidität infizierten Muttertier. [**Experiments on Trans-Placental Transmission of Toxoplasms by Female Animals infected before Pregnancy**] *Ztschr. f. Immunitätsf. u. Exper. Therap.* 1954, June, v. 111, No. 2, 110-20, 2 figs.

The object of the investigations described in this paper was to determine (a) whether female rats inoculated with toxoplasms before pregnancy (thereby presumably acquiring a latent infection) transmitted the infection to their offspring, and (b) whether the latter, in their turn, infected their own progeny (2nd generation).

In the course of this work, both the mother rats and their offspring were kept separately, isolated from any possible source of extraneous infection, and the results of the experiments were assessed by direct examination of tissues and organs of the experimental animals, and by inoculation of this material into hamsters, as well as by the dye test.

In the first set of experiments, a total of 7 female rats were inoculated intraperitoneally with peritoneal exudate of infected mice; in the case of 5 some 4 months before parturition, and in the case of 2 towards the end of pregnancy. The total number of young rats born from these mothers was 54. Half of these were killed (24), or were dead (3) at birth; among them toxoplasmic infection was revealed in 8. The remaining young mice were examined 10 months later by the dye test, which was positive in 8 out of 18 surviving animals and in 3 out of 9 that died before the end of the experiments. From these experiments it is evident that in rats the infection from mother to offspring can be transmitted *in utero*.

In the second set of experiments the progeny of the 2 females which were inoculated 2 days before parturition were used. The offspring of these pregnancies reacted negatively when subjected to the dye test 10 months after birth, whereas among those born from a 2nd pregnancy—5-6 months later—some proved to be infected. Some of the female rats of the 1st progeny of the 2 original females were then mated, and produced a total of 44 young of the 2nd generation. As in the previous experiments, 14 were killed, or were dead at birth: among these one proved to be infected. The surviving 15 were examined 10 months later by the dye test, which revealed 2 positive reactions. These experiments showed that, although in the offspring of mother rats inoculated 2 days before parturition there was no evidence of an infection, they were nevertheless infected and were probably able to transmit the infection to their own offspring. In other words toxoplasmosis is transmissible congenitally through 2 generations.

Finally, the bearing of these findings on human toxoplasmosis is discussed.

C. A. Hoare

PALENCIA, L., GONZÁLEZ, R. & VARELA, G. Terapéutica de la toxoplasmosis experimental del ratón blanco con Tetraciclina, Synnematin B, Methymycin, D-510 Sirex, Bemarsal, Camoquinal y Azacrin. [The Treatment of Experimental Toxoplasmosis in White Mice by Tetracycline and Various Other Drugs] *Rev. Inst. Salubridad y Enfermedades Trop. Mexico*. 1954, June, v. 14, No. 2, 113-16. English summary (5 lines).

Six mice were left untreated to serve as controls and all died in 6 days with many toxoplasms in the peritoneum. All the other tests were set up in groups of 5 mice and the results were as follows: (1) *Tetracycline*, 1 mgm. subcutaneously every 12 hours: one animal died on the 7th day with toxoplasms in the peritoneum; the rest died by the 16th day but showed no peritoneal toxoplasms. (2) *Synnematin B*, 5 mgm. subcutaneously every 12 hours: all died within a week, with many peritoneal toxoplasms. (3) *Methymycin*, 2 mgm. *per os* every 24 hours: all died within the week and toxoplasms were numerous in the peritoneum. (4) *D-510 Sirex*; same dose, same route and same result as with the last. (5) *Bemarsal*, 1 mgm. *per os* every 24 hours. One died of some bacterial infection on the 2nd day and the rest in 6 days with multiple peritoneal toxoplasms. (6) *Camoquinal*, 1 mgm. *per os* every 24 hours; all died by the 6th day. (7) *Azacrin*, same dose and same route as the last; all died in a week and, like the last, showed many toxoplasms in the peritoneum.

In brief, of all the drugs tried tetracycline was the only one to show any inhibition of the toxoplasma and that only partial; the others were totally ineffectual. Some details are given of the chemical composition of the drugs used.

H. Harold Scott

DERMATOLOGY AND FUNGUS DISEASES

MACKINNON, J. E. A Contribution to the Study of the Causal Organisms of Maduromycosis. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Nov., v. 48, No. 6, 470-80, 18 figs. on 4 pls. [59 refs.]

This review of the fungi which cause maduromycetoma, as distinguished from actinomycetoma, is based on the study of 83 fungal cultures and some histopathological preparations from cases of the disease. Seventy-five of the cultures were identified as follows: *Madurella mycetomi* 51, *M. grisea* 10, *Phialophora jeanselmei* 3, *Monosporium apiospermum* and *Aallescheria boydii* 8, and *Cephalosporium falciforme* 3; the first 3 species form black grains in the lesion and the other species yellowish-white grains.

M. mycetomi is the common cause of mycetoma with black grains found in tropical Africa, India and other Asiatic countries and also in parts of North and South America. In South America and, perhaps, in India, the geographical distribution of *M. mycetomi* and *M. grisea* shows some overlapping, but in such situations either of the species will be predominant. The parasitic grains of *M. mycetomi* consist of a radially-spreading, septate and branching mycelium measuring from 1 to 5 μ in diameter, with chlamydospores up to 25 μ in diameter. The mycelium is embedded in a brown, granular, interstitial material which gives the grain its hardness and black colour. The parasitic grain of *M. grisea* differs from that of *M. mycetomi* in that its central part is unpigmented or only slightly pigmented but it is surrounded by a blackish marginal or cortical zone. There was no observed interstitial substance in the central area but in the marginal zone

the mycelium was embedded in a brown cement which was unlike the brownish granular interstitial material of the *M. mycetomi* grain.

The distinctive morphological characters of the two species in culture have been described already [see Mackinnon, this *Bulletin*, 1952, v. 49, 994; and Mackinnon *et al.*, *ibid.*, 1950, v. 47, 490]. The author attaches importance to tests of the power to assimilate certain compounds as sources of essential carbon and nitrogen, in the identification of species. *M. mycetomi* can utilize, in this way, glucose, maltose and galactose but not sucrose as sources of carbon, and potassium nitrate, ammonium sulphate, asparagin and urea as sources of nitrogen. *M. grisea* possesses similar properties but is also able to utilize sucrose.

Of the many names given to the fungi of black-grain mycetoma, it is considered that *Madurella tozeuri*, *M. tabarkae*, *M. americana*, *M. ikedae*, *M. lackawanna*, *M. oswaldoi*, *M. virido-brunnea* and *Glenospora khar-toumensis* should pass to the synonymy of *Madurella mycetomi*.

Three strains of *Phialophora jeanselmei* from mycetoma were studied. The black grains did not resemble those of *Madurella*, but the fungus was not described.

With regard to *Monosporium apiospermum* and *Allescheria boydii*, which are widely distributed and cause mycetoma with yellowish-white grains, the author corrects his previous statement [see Mackinnon, *ibid.*, 1952, v. 49, 994] that these are unrelated species, and he agrees with EMMONS (*Mycologia*, 1944, v. 36, 188) and others that *M. apiospermum* is the imperfect or conidial stage of the ascomycete *A. boydii*.

Cephalosporium falciforme, isolated by CARRIÓN [this *Bulletin*, 1941, v. 38, 93; *Mycologia*, 1951, v. 43, 522] from mycetoma in Puerto Rico and also found in 2 cases of the disease in Brazil, is an authentic cause of mycetoma, and *Cephalosporium Recifei*, described by LEÃO and LOBO, is worthy of consideration, but *Cephalosporium granulomatis*, isolated from mycetoma by WEIDMAN and KLIGMAN [this *Bulletin*, 1946, v. 43, 778] may be identified with the common contaminant *C. acremonium*.

Other cultures await further study.

This work has done much to simplify the mycology of Madura foot.

J. T. Duncan

COURTOIS, G., DE LOOF, C., THYS, A. & VANBREUSEGHEM, R., with the collaboration of BURETTE. Neuf cas de pied de madura congolais par *Allescheria boydii*, *Monosporium apiospermum* et *Nocardia madurae*. [Nine Cases of Congo Madura Foot due to *Allescheria boydii*, *Monosporium apiospermum* and *Nocardia madurae*] *Ann. Soc. Belge de Méd. Trop.* 1954, Aug. 31, v. 34, No. 4, 371-95, 35 figs. on 14 pls. [28 refs.]

The absence of mycetoma from earlier reports on the mycoses of the Belgian Congo is attributed to the failure to recognize the disease in the rather modified clinical form shown in the 9 cases which are the subject of the present paper. In general, these cases did not conform to the classical picture of Madura foot with great swelling and a globular deformity caused by convexity of the sole and obliteration of the instep. Instead, the concavity of the plantar arch and the instep was to some extent preserved and the swelling was chiefly on the dorsum of the foot. Granulomatous nodules, presenting the openings of sinuses, were more or less numerous on the dorsum but might occur on any part of the foot and even on the lower third of the leg. The thin, often sero-sanguinolent discharge from the sinuses contained the soft yellowish-white "grains" of the causative

fungus, sometimes no larger than sand grains. The sinuses led to little cavities in the skin, the subcutaneous tissues or the bones, containing a fibrino-purulent exudate and the fungal grains.

The causative micro-organisms isolated in culture from 7 of the 9 cases described, were *Allescheria boydii* (1), *Monosporium apiospermum* (4) and *Nocardia madurae* (2). The organism in the remaining 2 cases, which was not cultivated, was *Nocardia* sp. probably *Nocardia madurae*.

The general clinical and histopathological features were alike in all types of infection and the symptoms varied from merely pain on walking to total disability. Detailed reports are given of the radiological findings which show that the bones of the foot were affected in all cases, those of the tarsus and metatarsus being principally involved, but the phalanges and sometimes the lower extremities of the tibia and fibula were also affected. The lesions showed osteolysis and cavity formation on the one hand and osseous condensation on the other. From the cavities and small foci the destructive process extended and led to pathological fractures. The articular surfaces were generally affected.

The histopathology of the lesions in the soft tissues was that characteristic of mycetoma. The parasitic grains of *A. boydii* and *M. apiospermum* were alike in appearance, measured up to 0.5×0.4 mm. and were irregular in outline and sometimes indented. The centre of the grain presented an amorphous appearance but the outer zone contained round or oval cells measuring up to 5μ or even 10μ in longer axis and connected with thick and closely septate hyphae. There were no club-formations but only an irregular eosinophile fringe on the surface of the grain. The grains of *N. madurae* were usually smooth and lobulated and oval in outline and measured, on an average, 0.35 by 0.25 mm. but often occurred in aggregations measuring 1.0 by 0.65 mm. Microscopically, the structure of the grain was characteristic of this species but there were no peripheral club-formations. The nomenclature and the morphological characters of the 3 species in culture are discussed.

In treatment, chemotherapy gave disappointing results; nevertheless, in a severe case caused by *M. apiospermum* the sulphonamides in the form of Sulphatriad 4 gm. daily for 15 days gave rapid and marked symptomatic relief with reduction of the swelling and drying of the sinuses, but radiology showed no change in the osseous lesions and after a few months the disease became active again. In two cases caused by *N. madurae*, the intravenous administration of pentamidine caused resorption of the infiltrate and brought about very marked symptomatic improvement, but the disease of the bones was not affected and the clinical relief was merely transient. It should be stated that nearly all of the 9 cases were of great chronicity.

J. T. Duncan

JANKE, A., with Alma HANSA. *Sporobolomyces roseus* var. *madurae* var. *nov.* und die Beziehungen zwischen den Genera *Sporobolomyces* und *Rhodotorula*. [*Sporobolomyces roseus* var. *madurae* and the Relationship between the Genera *Sporobolomyces* and *Rhodotorula*] Zent. f. Bakt. I. Abt. Orig. 1954, v. 161, Nos. 7/8, 514-20, 1 fig. [12 refs.]

The English summary appended to the paper is as follows:—

"1. It has been stated, that *Mycetoma pedis* (Madura foot) was incited by a species of *Sporobolomyces*.

"2. This species agrees well with *Sporobolomyces roseus* Kluyver et Van Niel (= *Sp. salmonaeus* Derx) in cultural, morphological and physiological properties, but is distinguished from it in (a) small size of the cells,

(b) pathogenicity, (c) loss of ability to form ballistospores and (d) tolerance to higher temperatures.

"3. It seems that many species of the genus *Rhodotorula* Harrison are derived from species of *Sporobolomyces* without property to ferment and having lost the ability to form ballistospores."

SLAUGHTER, J. C., Jr. **Stilbamidine in Treatment of Widely Disseminated Blastomycosis (with Two-Year Follow-Up).** *Arch. Dermat. & Syph.* 1954, Nov., v. 70, No. 5, 663-5.

"Two patients critically ill with systemic blastomycosis have been treated successfully with stilbamidine in total doses of 5.85 and 5.95 gm., respectively. One patient was extremely ill when treatment with stilbamidine was initiated, and it is considered that the drug undoubtedly was life-saving.

"One patient apparently had primary pulmonary involvement with secondary cutaneous lesions, whereas in the other patient the disease apparently spread from a primary cutaneous inoculation.

"Both patients are clinically and bacteriologically well at the present time, more than two years after treatment."

SCHWARZ, J. & ADRIANO, S. **Failure of Stilbamidine to arrest Experimental Blastomycosis in Mice.** *J. Investigative Dermat.* 1953, May, v. 20, No. 5, 329-30.

"Two milligrams per kilogram body weight of stilbamidine given in a single daily subcutaneous injection to mice did not inhibit the development of severe lethal pulmonary blastomycosis in mice."

BONILLA, E. **Treatment of Chromoblastomycosis with Calciferol. Report of Three Cases.** *Arch. Dermat. & Syph.* 1954, Nov., v. 70, No. 5, 665-7, 2 figs.

"This report deals with the results of the treatment of three patients with chromoblastomycosis with large doses of calciferol. Various types of treatment had previously failed to benefit these patients, all of whom had suffered from the disease for many years.

"One of these patients was given a solution of 3 gm. of potassium iodide by mouth daily in addition to the weekly dose of calciferol. This resulted in a relatively rapid evolution of the lesions. The combination of calciferol and iodine is producing a similar rapid regression of symptoms in three additional patients currently under treatment. No toxic effects were observed.

"An explanation is offered to account for the rapid response of patients with chromoblastomycosis to the combined use of calciferol and iodine."

TROPICAL OPHTHALMOLOGY

CHEN, C. W., SHIH, C. K., SHEN, C. W. & CHANG, J. M. [Trachoma Control Program in Taiwan. 3rd Report: The Result of Mass Treatment] *J. Formosan Med. Ass.* 1954, July, v. 53, No. 7, 449-58. [In Chinese.] English summary.

The authors describe mass treatment of trachoma in Taiwan during a period of 6 months in 1953. Patients were treated with 1 per cent. oxytetracycline ointment, twice a day in younger children and 3 to 4 times in older children, until a clinical cure was obtained.

The results were surveyed at intervals of 2 months. After 4 months 75.6 per cent. of 2,772 cases were cured. After 6 months there were 86.5 per cent. cured among 2,733. Details are given of the progress shown at each survey.

In 132 cases resistant to 2 months' treatment with oxytetracycline ointment, Tresamide [each 0.5 gm. contains sulphamerazine, 0.1 gm.; sulphadiazine, 0.2 gm.; and sulphathiazole, 0.2 gm.] was given by mouth in addition. After 2 months, 54.3 per cent. of cases were cured and 17.4 per cent. improved. At a third survey 5.2 per cent. showed recurrence.

H. J. O'D. Burke-Gaffney

PARASITOLOGY: GENERAL

MARQUES, R. J. Incidência de parasitas intestinais em 1,000 pacientes da secção de gastroenterologia de um consultório particular da cidade do Recife. [Intestinal Parasitosis among 1000 Patients in an Institute in the Town of Recife] *Brasil-Médico*. 1954, Jan. 2-30, v. 68, Nos. 1/5, 3-11. [14 refs.]

Previous records of the incidence of intestinal parasites in Recife have been largely concerned with children or persons of the poorer classes. The present paper deals with 1,000 found infected among the well-to-do, such as students, merchants, public officials, professors, lawyers, doctors and so on. The details given are, it is to be noted, of the different infections among the 1,000 positive cases. No reference is made to the general population, so by the term "incidence" is not meant the general prevalence, but the relative frequency of the different parasites among the infected.

Of the 1,000, males numbered 463, females 537; 983 were whites. The findings are analysed in various ways: first, according to the parasite itself, protozoal or helminthic; next, as to the multiplicity of parasites; third, to the various combinations with other protozoa or helminths. It will be obvious that so much detail cannot be included in an abstract and we must limit our remarks rather to generalities.

The commonest parasite was *Entamoeba histolytica*, found in 532 (53.2 per cent.), cystic forms in 267; *E. coli* comes next, 291, then *Trichuris trichiura*, 285, *Ascaris lumbricoides* 218, *Giardia intestinalis* 118, *Schistosoma mansoni* ova in 116, hookworm in 106, *Strongyloides stercoralis* larvae in 52, *Iodamoeba bütschlii* 19, ova of *Enterobius vermicularis* 17, *Taenia* ova in 3 only. As the total examined was 1,000 and all were infected with some parasite the percentage figures will be the same with a decimal point before the last digit. The parasite was single in 450 (45 per cent.)

and more than one in 550 (55 per cent.); 2 in 30.5 per cent., 3 in 17.1, 4 in 6.0, 5 in 1.1, 6 in 0.2, and 7 once only.

Further analyses are made of the numbers positive for each according to sex. Points worth special notice are the prevalence of *E. histolytica* as heading the list, and of the trophozoite forms of it—188 among the 532 positive. As the author acknowledges, he used the "ordinary methods of enrichment" [these are not specified]; had particular methods been used, the totals would, doubtless, have been greater. He stresses the point that it is important to examine the faeces of all patients coming for treatment, regardless of their social status.

H. Harold Scott

SATYA PRAKASH. **Note on Natural Parasitic Infections found in *Rattus rattus* of Delhi Municipal Area.** *Indian J. Malariology*. 1954, June, v. 8, No. 2, 115-16.

Since 1950, studies in *Plasmodium berghei* in the Malaria Institute of India have involved the use of 616 specimens of *Rattus rattus* obtained from the municipal area of Delhi. These have been examined as a routine for parasites at the time of receipt and the results are recorded in a table, in percentages and by months. Three protozoan parasites were found in the blood, namely *Trypanosoma lewisi*, 205 (33 per cent.); *Babesia decumani*, 60 (9.8 per cent.); and *Hepatozoon muris*, 79 (13 per cent.). One helminth, *Hymenolepis diminuta*, was found encysted in the liver, and occasionally in the spleen, lung and kidney. It occurred 248 times (40 per cent.) [this is shown in the table as 60 per cent.]. In one rat 18 cysts were found.

There was considerable monthly variation in the incidence of the parasites. It is noted that *Babesia* and *Hepatozoon*, did not occur at all in the first quarter of the year.

Patency was noted with *Babesia* in one case for 37 days, with *T. lewisi* for 35 days and with *Hepatozoon* for 15 days.

H. J. O'D. Burke-Gaffney

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

JENKINS, D. W. **Advances in Medical Entomology using Radioisotopes.** *Exper. Parasit.* New York. 1954, Sept., v. 3, No. 5, 474-90. [Numerous refs.]

This paper gives an interesting and informative account of its subject, including much numerical data, some in a readily assimilable tabular form. The scope of the review is indicated fully in the author's summary:—

"1. Radioisotopes have been used to great advantage in the field of medical entomology. They have been used to tag arthropods for ecological studies of dispersal and flight range, longevity, hosts and feeding habits, predation, and parasitism. Radioisotopes can be expected to help determine the epidemiological role of arthropods more accurately.

"2. Ectoparasites of vertebrate animals have not been made radioactive and it is suggested that ticks, fleas, lice and mites can be radioactively

tagged by injecting the vertebrate host animal with radioisotopes. A few internal parasites have been made radioactive.

"3. Studies of disease transmission by arthropods using radioactive marked pathogens offer a promising line of investigation. Some nematodes, protozoans, bacteria, and viruses have been made radioactive and are suitable for use. A transmission experiment using labelled bacteria in the housefly was carried out.

"4. Radioisotopes have been used extensively in tagging insecticides and valuable information has resulted. Airplane sprays have been assessed using radioisotopes and several advantages have been found."

D. S. Bertram

See also p. 286, RAJAGOPALAN *et al.*, **Development of Resistance to B.H.C. by *C. fatigans* in the Course of a Larva Control Programme.**

CLARK, E. W. & BALL, G. H. **The Major Inorganic Constituents of Whole Bodies of Adult *Culex tarsalis* and *Culex stigmatosoma*.** Reprinted from *Physiol. Zoöl.* 1954, Oct., v. 27, No. 4, 334-41. [45 refs.]

"1. The inorganic ions of *C. tarsalis* and of *C. stigmatosoma* were analysed quantitatively.

"2. No valid statistical differences were found for the inorganic constituents of the two species."

See also p. 284, JACHOWSKI, **Filariasis in American Samoa. V. Bionomics of the Principal Vector, *Aedes polynesiensis* Marks.**

HOCKING, B. **Flight Muscle Autolysis in *Aedes communis* (De Geer).** *Mosquito News.* 1954, Sept., v. 14, No. 3, 121-3, 3 figs.

In the female *Aedes communis* found at Churchill, Manitoba, the breakdown of flight muscles is thought to provide a source of nitrogen which is used for egg development [this *Bulletin*, 1953, v. 50, 160]. It is now known that this process takes about 18 days and that the quantity of nitrogen obtained in this way could provide for the development of 18 eggs. The average number of eggs developed is 65. No trace of blood feeding has been found in this form of *Aedes communis* and no morphological distinction has been shown between it and the blood-feeding form.

Some specimens of the chaoborine species *Mochlonyx culiciformis* collected in July 1952 also showed this phenomenon. Anne Hudson

BECKEL, W. E. **The Lack of Autolysis of the Flight Muscles of *Aedes communis* (De Geer) (Culicidae) in the Laboratory.** *Mosquito News.* 1954, Sept., v. 14, No. 3, 124-7, 3 figs.

Following reports of muscle autolysis in *Aedes communis* the author collected a number of pupae of this species from pools in the Fort Churchill, Manitoba region, and fed the emerging females on sucrose alone. He found no sign of reduction or histological abnormality in the flight muscles, even in females with fully developed eggs. It was suggested that there might be two forms of *A. communis* at Churchill, but the ratios of proboscis to wing length were found to be very similar in forms which showed autolysis and in those which did not. The presence of larval muscles and extensive fat body in recently emerged adults is shown in an

illustration: these may provide a source of nitrogen. However, in other species of mosquitoes where these are also present, a blood meal is still required for egg development.

Anne Hudson

JENKINS, D. W. & WEST, A. S. **Mermithid Nematode Parasites in Mosquitoes.** *Mosquito News*. 1954, Sept., v. 14, No. 3, 138-43. [19 refs.]

Mermithid nematodes, believed to be a new species of the genus *Hydromermis*, were found in many larvae of mosquitoes, mainly *Aedes communis*, in their natural breeding places in Canada. They occurred widely in the haemocoel of the larvae.

Many larvae die of their infection or after the worms have ruptured the larval integument when they escape. There may be as many as 3 or more of the parasites in a single larva. It is known that this parasitic phase is an immature form of the worm, the adults occurring apparently under stones and plant debris or in mud. There is a considerable literature on mermithid parasites in mosquito larvae and adults and this is reviewed in the present paper. It is thought that this form of parasitization may have some use as a biological method of mosquito control; but it still remains to breed large numbers of the parasite and devise ways of disseminating it.

D. S. Bertram

MITLIN, N., KONECKY, M. S. & PIQUETT, P. G. **The Effect of a Folic Acid Antagonist on the House Fly.** *J. Econom. Entom.* 1954, Oct., v. 47, No. 5, 932-3.

Previous studies of anti-metabolites have usually been made with vertebrates or micro-organisms, rarely with insects. In this study the house-fly was used as an experimental animal to show the antagonism between 4-amino-pteroylglutamic acid (aminopterin) and folic acid. Different quantities of aminopterin were added to the fly-rearing medium (CSMA formula, based on dried grass, cereals, etc.). At rates from 0.0125 to 0.1 per cent., the aminopterin prolonged the larval period, and no flies emerged at rates of 0.05 or 0.1 per cent. When different quantities of folic acid were added to meal containing 0.025 per cent. aminopterin, the antagonistic effect of the latter was gradually overcome, so that with 0.025 per cent. folic acid and above the rate of development was normal.

These experiments suggest that flies might be useful for experiments with anti-metabolites, though the heterogeneous nature of the micro-organisms in the media is a defect. Also this suggests a new possible approach to insect control.

J. R. Busvine

GERSDORFF, W. A. & MITLIN, N. **The Relative Toxicity of some Aryl Analogs of Allethrin to House Flies.** *J. Econom. Entom.* 1954, Oct., v. 47, No. 5, 888-90.

GERSDORFF, W. A., MITLIN, N. & BEROZA, M. **Comparative Effects of Sesamolin, Sesamin, and Sesamol in Pyrethrum and Allethrin Mixtures as House Fly Sprays.** *J. Econom. Entom.* 1954, Oct., v. 47, No. 5, 839-42.

Sesame oil is known to contain a crystalline substance, sesamin, which is synergically active with pyrethrins, but the residue is also very active,

suggesting that more than one synergist is present. In a recent investigation further compounds have been isolated from sesame oil. These were (i) sesamol, which is similar to sesamin in composition except that one of the methylene dioxyphenol groups is attached to the central nucleus by an ether linkage, instead of direct; (ii) sesamol, which is 3,4-methylenedioxyphenol, and (iii) a sterol of unknown composition.

In preliminary tests, sesamol and the sterol were found to have no synergic effect with pyrethrins or allethrin. Sesamol, however, was found to be much more active than sesamin. Used at a 1:1 ratio, it increased the toxicity of pyrethrins 31 times, whereas the same amount of sesamin only gave an increase of 8 times, which was equal to a 0.2:1 sesamol-pyrethrin mixture. Both sesamin and sesamol acted as synergists with allethrin at the concentrations used, but only slightly ($\times 1.3$ to 1.5).

J. R. Busvine

TSAO, C. H., HORNSTEIN, I. & SULLIVAN, W. N. **The Joint Action of Chlorinated Terphenyl with Lindane and with Allethrin.** *J. Econom. Entom.* 1954, Oct., v. 47, No. 5, 796-8.

This paper describes further tests of a chlorinated polyphenol film which appears to prolong the action of *gamma* BHC [Hornstein and Sullivan, this *Bulletin*, 1954, v. 51, 854]. In topical application tests with house-flies, chlorinated terphenyl at twice the concentration of lindane (99 per cent. *gamma* BHC) slightly reduced its toxicity. On the other hand, in similar tests the terphenyl slightly increased the insecticidal action of allethrin. However, this effect was small compared with the action of an established synergist such as piperonyl butoxide.

In tests with residual deposits of allethrin, with and without chlorinated terphenyl, the latter reduced the toxicity of allethrin but prolonged its action. For the first 2 or 3 weeks, therefore, the mixture was less effective than plain allethrin, but it remained active for 3 months, by which time the allethrin alone was quite without effect.

J. R. Busvine

GRENIER, P. & BERTRAND, H. Simuliidae (Diptera, Nematocera) d'Espagne. [**The Simuliidae of Spain**] *Ann. Parasit. Humaine et Comparée*. 1954, v. 29, No. 4, 447-59, 2 figs.

LEWIS, D. J., HENRY, A. J. & GRINDLEY, D. N. **Daily Changes in the Numbers of Chironomid Midges at Khartoum.** *Proc. Roy. Entom. Soc. of London*. Ser. A. 1954, Sept. 30, v. 29, Pts. 7/9, 124-8, 2 figs.

"*Tanytarsus lewisi* Freeman and other small chironomids are a serious pest at Khartoum, chiefly from 50 to 300 metres south of the Blue Nile where their numbers vary greatly from evening to evening.

"The results of catching the midges with a light trap are described. Various possible causes of fluctuations in numbers are considered and it is concluded that a bad evening usually follows a day with an average wind speed of more than 11 miles per hour during which the midges are blown to shelter in the affected area."

HEISCH, R. B. *Argas brumpti* Neumann in the Kitui District of Kenya. *East African Med. J.* 1954, Oct., v. 31, No. 10, 483-4.

LAPIERRE, J. & LARIVIÈRE, M. Réaction allergique aux piqûres de réduvidés (*Rhodnius prolixus*). [Allergic Reaction to Bites of *Rhodnius prolixus*] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 4, 563-6.

Severe shock, sometimes fatal, has been reported as the result of bee and wasp stings [e.g. see this *Bulletin*, 1954, v. 51, 991] but insect bites have seldom provoked such intense reactions. The Reduviid bugs which transmit *Trypanosoma cruzi* bite man, and though the reaction to the bite is seldom severe, cases of sensitization producing local discomfort and perhaps oedema of the limb have been reported [*ibid.*, 1950, v. 47, 1131; 1954, v. 51, 324]. [The reviewer, occasionally bitten experimentally by *Rhodnius prolixus* over 20 years, has gradually become more sensitive, so that now a bite gives a severe reaction with considerable oedema.] In the paper under review a woman scientist who had often been bitten accidentally by *Rhodnius* without ill effects, became suddenly more sensitive, and the bite of one larva only, produced, in addition to a severe local reaction, symptoms of intense shock which were relieved with difficulty with antihistamine injections. A few days after recovery, it is reported that she gave a local reaction to the bite of the mosquito *Aedes aegypti*, though previously she was insensitive to that insect.

K. Mellanby

BRACEY, P. Urea-Formaldehyde Resin as a Vehicle for Semi-Permanent Insecticidal Residues to Control Flies and Mosquitoes. Reprinted from 1st International Symposium on the Control of Insect Vectors of Disease. pp. 344-93, 9 figs. on 5 pls. [30 refs.] 1954. Rome: Istituto Superiore di Sanità, Viale Regina Elena, 299.

Early attempts to incorporate insecticides in paints or varnishes failed because the DDT used was embedded in the paint film and therefore unavailable [BARNES, *Bull. Hyg.*, 1946, v. 21, 40]. Later it was found feasible to obtain a crystalline bloom of DDT on the surface of paint or synthetic resin; and this bloom might be renewed if wiped away. [GILMOUR, *ibid.*, 1947, v. 22, 337; BLOCK, *ibid.*, 1948, v. 23, 621]. The last mentioned author showed the promise of urea-formaldehyde resin, which has been further studied in this paper.

It was found that urea-formaldehyde resin alone is not very satisfactory, and a plasticizer (castor oil alkyd resin) was added to encourage the blooming of insecticide.

In addition to the two resins, solvents were necessary as well as insecticide. A typical formula is the following:—

" BE610 "	urea-formaldehyde resin	...	...	50 parts
" BA502 "	castor oil alkyd resin	...	...	50 "
Butanol	...	...	...	27.5 "
Xylol	...	...	...	22.5 "
Insecticide	...	...	...	12 "

This makes a clear, free-flowing lacquer containing 40 per cent. solids. Drying and hardening after application are achieved mostly by acid accelerators or by heat, or both. The principal accelerator was 10 per

cent. sulphuric acid in butanol; 1 part of this was added to 20 parts of lacquer just before use.

The effectiveness of the insecticidal films was judged by the mortalities of house-flies or mosquitoes (*Aedes aegypti*) after standard exposures. The liability to "blooming" after stimulation was judged by the appearance of the films after batches of flour beetles (*Tribolium castaneum*) had been confined for 24 hours on the surface.

Resins containing DDT were "cured" to different degrees of hardness and it was found that increasing hardness suppressed blooming and reduced the insecticidal effect. Apart from the use of acid accelerators or heat, the hardness of the resin could be increased by reducing the amount of castor oil alkyd plasticizer (and *vice versa*). A very superficial hard film could be produced by exposing the resin to ultraviolet light. Rather softer resins could be produced by using solvents of higher boiling point than xylene and butanol.

As already mentioned, a softer finish (so far as compatible with durability) gave a more effective insecticidal bloom; but on the other hand this tended to give greater losses when the surface was cleaned.

Experiments were made with insecticides other than DDT, including *gamma* BHC, dieldrin, aldrin and pyrethrins with or without the synergist piperonyl butoxide. All the solid insecticides tended to "bloom" spontaneously at high concentrations and, at lower ones, all but aldrin could be induced to bloom by the mechanical stimulation of beetles walking on them. With pyrethrins there was no bloom, but a slight greasy exudate.

The insecticides *gamma* BHC and aldrin were effective in the vapour phase and this action occurred at much lower concentrations than the contact toxicity. Thus at 5 per cent. DDT failed to bloom and was non-toxic, whereas *gamma* BHC and aldrin were active down to 0.25 per cent. However, the vapour action was of much shorter duration. For example, resin containing as much as 20 per cent. *gamma* BHC was found to be non-toxic to *Aedes* after 3 months' exposure on a south wall, whereas similar rates of dieldrin and DDT maintained their effectiveness. Pyrethrins too, lost toxicity rapidly out of doors (in 3 weeks) though much less slowly in a laboratory or constant temperature room.

The loss of vapour phase from the volatile insecticides could be reduced by using harder resins, either by ultraviolet light exposure or by adding less plasticizer. On the other hand, this reduced insecticidal effect as well as prolonging it. The toxicity of the vapour phase could be increased by adding to the resin an inert ingredient with large molecules (α -hydroxy α -methyl butyric acid) which probably acted by keeping the resin from polymerizing in a tight lattice.

Application of resins to different types of surface did not seem to affect their insecticidal efficiency except when they were put on fresh high gloss paint.

Some tests with tsetse flies (*Glossina palpalis*) did not suggest that the insecticidal resins were irritant or repellent, except for the pyrethrin or allethrin ones. However, tests with *Aedes* showed a slight "contact-repellency" with DDT-containing resins.

The industrial application of insecticidal resins is discussed in regard to the production of paper coatings and a paint for walls or furnishings. Some idea of the relative costs of the lacquers are given; they range from 50/- to 75/- per gallon; except for the pyrethrin lacquers which are much more expensive.

The toxic hazards from the use of these resins are considered to be no greater than for other residual treatments.

J. R. Busvine

BARLOW, F. & HADAWAY, A. B. **An Investigation of some Factors controlling the Efficiencies of Non-Crystallizing Insecticides in Resin Films. Part 1. Films containing Urea-Formaldehyde Resins plasticized with a Castor Oil Alkyd.** 23 mimeographed pp., 5 figs. on 3 pls. **Part 2. Films containing various Resins and Plasticizers.** 14 mimeographed pp., 3 figs. on 3 pls. 1954. Porton: Colonial Insecticides Research Unit.

Part 1 of this Report records a rather more systematic study of the investigations described by BRACEY [see above]. In general, the same methods and materials were used and, in addition, chemical estimations of insecticide residues were made to supplement the biological data.

The effects of varying the ratio of urea formaldehyde ("UF") resin to its plasticizer, castor oil alkyd resin, were further examined. It was found that resins containing 5 per cent. aldrin had both contact and fumigant action but that these were largely suppressed by hardening and polymerization of the film with a 75:25 ratio of UF:alkyd. Ratios of 50:50 and 25:75 gave much better results, up to 4 weeks (and for at least 14 weeks with 5 per cent. dieldrin). This is reflected in chemical data by the rather rapid loss of aldrin (by vapour) from 25:75 (UF:alkyd) films, a steady loss from 50:50 and very little loss from 75:25, because the insecticide was "locked up" inside the film.

The surface hardening and insecticide-retaining effects of ultra violet rays, were confirmed, this effect being more pronounced in retaining aldrin and dieldrin than *gamma* BHC. However, this is not considered to be of practical importance.

The effects of concentration of insecticide on effectiveness and persistence were studied, with the use of 50:50 UF:alkyd resin. At first the effect was proportional to concentrations. After initial hardening the (5 per cent.) dieldrin efficiency was slightly reduced but thereafter remained constant for many weeks. In contrast, the aldrin and *gamma* BHC films (10 per cent.) fell off steadily and became virtually useless after 4 to 6 weeks.

These authors do *not* support Bracey's claim that insecticides in UF-alkyd films are equally effective when applied to all types of surface. Their action is shown to be greatly reduced on application to absorbent surfaces, such as dried mud (and to a lesser extent, on paint and wallboard). This appears to be due to the solvents containing the insecticide soaking farther into the substrate than the resin solids.

Part 2 of this report deals with a similar investigation of other types of commercially available synthetic resins and their appropriate plasticizers, compared with UF-alkyd resin.

The efficacy of the different formulations depended on the physical properties of the films produced. For example, in the absence of plasticizer, the availability of the insecticides depended on the rate and extent of hardening, and consequently the permeability of the film. Thus, the Coumarone-indene ("C.460" resin) and a chlorinated rubber (Alloprene B) dry rapidly and the resulting films are impermeable, so that insecticidal action (either contact or vapour) is negligible after 24 hours. Other quick drying resins, such as "Bedacryl 122X" or "Texilac 190", are more permeable and their films remain active for at least several weeks. With other resins, hardening results from slow polymerization over several days or weeks, the eventual effect being complete loss of insecticidal effect (UF-resin or "Styresol 9255") or moderate activity (as in "Wresinol 6").

The effects of plasticizers with other resins are similar to those described

with UF. Each particular combination has an optimum ratio for insecticidal efficiency and persistence. The UF resin has the advantage over many others of permitting incorporation of exceptionally high proportions of plasticizer.

Only a few commercially available resins were tested in combination with plasticizers. Of those tested, the 70:30 "Alloprene": "D.O.P.", the 90:10 "Styresol": "D.O.P." and the "Texilac 190" formulations were slightly less active than the standard 50:50 UF:alkyd resin. However, they had the advantage of drying at air temperatures without addition of an acid accelerator (which has to be added to UF-alkyd resin just before application).

J. R. Busvine

REPORTS AND SURVEYS

COLONIAL OFFICE. **Colonial Research 1953-1954. Colonial Medical Research Committee. Ninth Annual Report (1953-1954)** [HIMSWORTH, H. P., Chairman] (pp. 85-140). Cmd. 9303. 278 pp. 1954, Oct. London: H.M. Stationery Office. [7s. 6d.]

This report follows the general plan of its predecessors; it is not merely a list of items, but is an informative account of the work done, the backgrounds and the main conclusions.

In the general account of the work of the Committee it is made clear that serious attempts are being made to associate scientists in home-based research organizations more closely with research in the Colonial territories, by means of grants for work abroad, and for work in Britain by men normally stationed abroad. Various conferences are mentioned, and there is a considerable list of visits paid to the different overseas research institutions by scientists from Britain.

The main part of the report is a review of work in progress or completed during the year, and this part is divided according to subjects—helminthiasis, malaria, virus diseases, leptospirosis, animal-borne diseases, relapsing fever, physiological research, sickle-cell trait, leprosy, and goitre; it ends with an account of the research laboratories in Gambia, and of the East African Medical Survey. Much of the work has already been published and reviewed in this *Bulletin*.

No mention is made in this report of research in trypanosomiasis, which is dealt with by the Tsetse Fly and Trypanosomiasis Committee, and similarly insecticide research is dealt with by the Colonial Insecticides, Fungicides and Herbicides Committee.

The chief helminthological problems studied were the transmission of *Loa loa* by *Chrysops* spp. (in the Cameroons); the spread and control of onchocerciasis in East Africa (a note is made that repeated small doses of diethylcarbamazine will finally sterilize the skin of an infected person); the transmission of *Wuchereria malayi* and the treatment of this infection with doses of diethylcarbamazine which, after subsidence of the initial febrile reaction to the first doses, can be tolerated in single daily doses up to 22 mgm. per kgm. (a note is made that *Aedes (Finlaya) chrysolineatus* can be experimentally infected with *W. malayi*); the transmission and control of *Dracunculus medinensis* in Nigeria; the transmission of *Schistosoma haematobium* through *Bulinus forskali* in Gambia.

Malaria research occupies much space. At the East African Malaria Unit fundamental work on the biology of *Anopheles gambiae* and *A. funestus* was done, and has been noticed in this *Bulletin*. Particular attention was paid to the resting and biting activity, and to the maxillary indices. In Nigeria the Ilaro control scheme has been completed, and one interesting fact recorded is that although after cessation of the insecticidal spraying the spleen and parasite rates in the sprayed area gradually rose, there was little evidence of increased morbidity and mortality, and certainly no epidemic of malaria. In Western Sokoto a much more ambitious control scheme is projected, the area of 600 square miles, containing 120,000 people, is intensely malarious, and the general pre-puberty mortality rate is said to be 537 per 1000 live births. Elsewhere a long-term suppression experiment in children, with a dose of 25 mgm. pyrimethamine each week, has shown good results; the oral temperatures of treated and control children did not differ, but the spleen rates and parasite rates were remarkably reduced in the treated children.

In Trinidad the late Major Senior White worked on mosquito problems. In Malaya it has been shown that a strain of *P. falciparum* resistant to proguanil, from a gametocyte carrier receiving full doses of the drug, could be passed through mosquitoes and could infect volunteers similarly protected. It seems therefore that the resistance extends to pre-erythrocytic forms and to gametocytes. It has been shown that when BHC was used as a larvicide, the larvae of *Culex fatigans* eventually showed resistance to it—the first proof in Malaya of resistance of a mosquito to a larvicide.

Virus work has been taken up vigorously. In the West African Virus Research Institute a test for the detection of yellow fever antibodies has been developed, which is based on the fact that agglutination of red cells by the virus is inhibited by immune serum. At the East African Virus Research Institute the scope has been broadened to include subjects other than yellow fever, and many problems relating to other viruses are now examined. In particular an investigation was made into an epidemic in Tanganyika in which 2 viruses—one related to dengue—were isolated. The transmitting arthropod was *Aedes aegypti*. In Trinidad sera have been collected which were transmitted to the Rockefeller Foundation laboratories in New York, and there examined for affinities with various viruses. It appears that neutralizing antibodies to the Ilheus virus are not uncommon, though this virus has not hitherto been isolated from man.

In Malaya work is continued on problems related to scrub typhus, the animal hosts and the vector mites. Moreover, it is becoming apparent that infections with Ntaya, Zika, Semliki Forest, Uganda S and Bunyamwera viruses occur in Malaya, though Bwamba virus “appears to have left no antibody trails”. Japanese encephalitis has been recognized for some time. Early in 1954 there was an epidemic of influenza which, for the first time in South-East Asia, was completely analysed and documented by modern laboratory methods. Interest has been shown in leptospirosis in Malaya and North Borneo, where strains of 6 sero-groups have been isolated.

Relapsing fever was studied in East Africa, where tick infestation of huts in some places reaches 60 per cent.; 6 forms of *Ornithodoros moubata* can be recognized. Yet the incidence of relapsing fever is not high, and this is presumed to reflect a state of immunity in the adult population. It is stated that in very heavily infested tribes “the infection becomes manifest by a high neo-natal mortality”, but no evidence is quoted to support that statement.

The report contains a section on the identification of blood meals in insects, by an inhibition test previously described, and elaborated during

the year; it is proving more accurate than the precipitin test. Another short section deals with research on the acclimatization of *Aedes aegypti* to conditions of excessive warmth.

Physiological and nutritional research has centred round protein metabolism in Uganda, industrial comfort studies, and fitness tests after long marches by troops, in Nigeria. The relationship between the sickle-cell trait and susceptibility to *P. falciparum* malaria has been the subject of considerable study.

In leprosy the value of dapsone (DDS) has been confirmed, but thiosemicarbazone proved disappointing, and isoniazid almost useless. Work on lepromin and tuberculin indicates that low-grade sensitivity to tuberculin may be provoked by a non-specific factor, possibly infection with a related organism, which may be the leprosy bacillus. In Singapore the use of BCG gave only slight conversion of the lepromin reaction.

An investigation of goitre has been carried out in Sierra Leone.

At the Medical Research Council Laboratories, Gambia, it has been shown that malaria control has had a beneficial effect, and that malaria is the dominant single factor in the production of the hepatomegaly so common in Gambian children.

The East African Medical Survey, now 5 years old, reports surveys of 4 areas in which the disease patterns have been explored and recorded; more detailed information will be published when the 40,000 records have been statistically examined.

The report ends with a note on research undertaken and financed by the medical departments of various territories—the Institute for Medical Research, Kuala Lumpur, Malaya; the University College of Jamaica; the Division of Insect-Borne Diseases of Kenya. These have added valuable studies on thiamine, the vomiting sickness and the psittacosis-lymphogranuloma viruses, and on an outbreak of kala azar in Kenya.

This is a good and stimulating report. Some financial details of schemes approved during the year are given in the general report of the Colonial Research Council, but it is laborious to disentangle the medical from the numerous other schemes, so that there is no easy appreciation of the extent of medical research as measured by finance, which is a pity. The writing is usually clear and interesting, though there have been many contributors. Readers who wish to know more details of the research carried out are helped by the numerous references to papers and reports published.

A statement of general policy in initiating research and in making grants to applicants would add very greatly to the interest of future reports.

Charles Wilcocks

GRASSET, E. Problèmes épidémiologiques et médico-sociaux en Indonésie. [**Epidemiological and Medico-Social Problems in Indonesia**] *Acta Tropica*. Basle. 1954, v. 11, No. 4, 337–53, 5 figs.

Professor Grasset, Director of the Institute of Hygiene of Geneva, was a member of the medical mission of the World Health Organization which visited Indonesia in 1953. In this address he discusses briefly certain epidemiological and medico-social problems of that large archipelago, more especially those of Java.

The total population of Indonesia's 2,600 inhabited islands is estimated to be 75 million, of which 52 million are concentrated in Java where the density of population approximates 400 per square kilometre. To serve the medical needs of this vast population there are only 1,400 doctors, of whom only 800 are in the service of the State. There are 3 medical schools, at

Jakarta (Batavia), Soerabaja and Jogjakarta, which together turn out about 50 graduates a year. The numbers of technicians, engineers and sanitary inspectors are likewise very inadequate.

Malaria continues to be the chief cause of morbidity and death. In the chief centres of population an energetic campaign has been waged with DDT as a residual insecticide. Since the Second World War the size of some of the urban agglomerations has increased in a chaotic manner. Jakarta had in 1940 a population of about half a million: today it has a population of between 2 and 3 million.

Water-borne infections are very prevalent—typhoid and paratyphoid fevers, bacillary, and amoebic dysentery, and infant diarrhoea. From the records of the Eijkman Institute at Jakarta it appears that 5 to 7 per cent. of the population of the Western Province of Java were typhoid carriers. Brucellosis (*Br. abortus*) is widespread among livestock.

By 1943 the incidence of plague had been reduced to almost negligible proportions by the extensive use of Otten's live vaccine. This vaccination campaign was in suspense during the Japanese occupation of Java and plague became alarmingly prevalent once more. Large-scale vaccination was resumed in endemic areas in 1948 and the present incidence of the disease is but a few hundred cases a year. The use of streptomycin in the treatment of plague is very restricted, owing to its high cost.

Treponema infections are second only to malaria as important causes of morbidity: syphilis in urban and yaws in rural communities. It is estimated that from 15 to 35 per cent. of the rural population are infected with yaws. With the help of WHO and UNICEF a vast national campaign against yaws was started in 1950. In urban agglomerations where yaws and syphilis infections are superimposed, syphilis comes within the scope of the campaign, with special attention to the treatment with penicillin of infected pregnant women. By 1953 more than 6 million people had been examined and 71 treatment centres had been set up.

Tuberculosis presents a very grave problem which has become much more acute since World War II. It is probably responsible for 10 per cent. of the total mortality. The uncontrolled growth of urban agglomerations has been an important factor in the widespread diffusion of infection. The assistance of WHO and UNICEF has been solicited in the organization of a BCG campaign. Work has started in Bandoeng.

The number of persons with leprosy in Indonesia is estimated to be 70,000. Malnutrition is rife and deficiency syndromes numerous and varied.

Norman White

BOOK REVIEWS

MANSON'S TROPICAL DISEASES. A Manual of the Diseases of Warm Climates.

Edited by Sir Philip H. MANSON-BAHR, C.M.G., D.S.O., M.A., M.D., D.T.M. & H., F.R.C.P. 14th Edition, pp. xiv + 1144, 26 pls. (15 coloured), 414 text figs., 8 maps & 29 charts. 1954. London: Cassell & Co., Ltd., 37/38 St. Andrew's Hill, E.C.4. [60s.]

To review a book, world-wide in repute, which has reached its 14th edition in a little more than half a century and has, in addition, been reprinted 17 times, is not, *experto crede*, so simple and easy a matter as many imagine.

To justify the issue of a new edition, as contrasted with a reprinting, advances in the subject must be numerous or important, and this certainly is the case in tropical medicine. To tell of these advances without unduly increasing the size of a one-volume work must be exceedingly difficult, if the original basic structure and lay-out are to be retained. This difficulty has been admirably overcome by the Editor (who is, in fact, the author), Sir Philip Manson-Bahr, who, by cutting out 28 brief and sketchy histories and by other omissions and changes to be mentioned later, has made room for new matter, so that this latest edition has only one page more letterpress than the preceding; the additions are evidenced by the fact that the index is 6 pages longer. Only by judicious pruning of old matter and careful selection of new can this work, which is becoming somewhat bulky, retain its position as the most popular and informative one-volume work on tropical medicine; a popularity and usefulness which might be endangered if it became necessary to issue it in 2 volumes or to increase the price further; the present edition costs one-third as much again as its predecessor.

Every chapter shows signs of very careful revision and it is only by comparing page by page, even paragraph by paragraph, of the new with the old can one gauge the deliberation which must have been exercised before additions or elisions have been made. Noteworthy among the additions are accounts of epidemic haemorrhagic fever and Izumi fever (chap. 22), kwashiorkor (chap. 29), other forms of encephalitis than encephalitis japonica and acute anterior poliomyelitis (chap. 38), and examination of urine for ova of *Schistosoma haematobium* (Appendix, Section B). Plate IV depicting *Glossina brevipalpis* and *G. tachinoides* is new and Plate V, *G. palpalis* and *G. morsitans*, now appears in black and white in place of the beautiful coloured plate by Terzi, while the old Plate VI, of the coloured female ticks, has been omitted. Other notable omissions are the sections on housing, nutrition, diet and food values, thus saving 10½ pages, and the account of penicillin, to which a special chapter was devoted in the previous edition, saving 5 more pages. These have allowed the inclusion of much new matter without increasing the size of the book. Most of the misprints of the 13th edition have been corrected; one or two remain, e.g., *Anopheles culicifacies* (p. 1031) and *A. pharænsis* æ diphthong (p. 1037) and as æ diphthong in the index (1092).

Next, a few words on details of changes: the introductory paragraph of chap. 1 has been omitted and the Editor plunges at once in *medias res* to the health of those contemplating residence in the tropics, adding a note on insect bites and relief of irritation resulting therefrom. In chap. 2, primary splenic abscess, common in Rhodesia, finds place in the section on cirrhosis of the liver [surely it would deserve a separate section or subsection]; rickets (*youbas* on the Gold Coast) is inserted. The history section on malaria (chap. 4) has been omitted; this is no real loss as it was too brief and sketchy to be usefully informative. Plate II of stained malaria parasites is better than before, where the colours were fading. The section on the mechanism of haemolysis in blackwater fever has been recast. The treatment of malaria has been revised and largely rewritten; new drugs and their uses are discussed. The use of Daraprim (pyrimethamine) in prophylaxis is new, while notable omissions are the determination of plasma atebrin by Maegraith's method and the assessing of antimalaria drugs by culture. The technique of artificial infection of mosquitoes has been re-written. The electrical properties of trypanosomes (chap. 5) have been omitted and rightly, we think, for they are of no importance to the tropical practitioner. A new figure 16 depicting a trypanosomiasis rash in a

European replaces the old. The adverse verdict on pentamidine (p. 176 in the 13th edition) is reversed in the account of its isethionate (p. 161 in the 14th edition). The two illustrations of leishmanial lesions of the arm and hand have been replaced by a better one of the nose with lymphatic spread to the chin.

The coloured plates of ticks (chap. 7) have been replaced, without much loss, by ordinary text-figures. Other changes in this chapter include the use of antibiotics other than penicillin (the only one mentioned in the 13th edition) and omission of the final summary of general considerations on varieties of relapsing fever. Swineherds' disease (leptospirosis *pomona*) is freshly described; previously it was mentioned as a synonym of 7-day fever in Australia.

The section on the treatment of louse-borne typhus (chap. 11) has been practically re-written and the use of antibiotics in Rocky Mountain fever is new. Q fever is rightly called "Query fever" and this, we hope, will give the quietus to the widely prevalent idea that the Q stands for Queensland where the disease was first described in 1935. Rickettsialpox (section IX) is enlarged and much more detailed. Treatment of plague (chap. 12) by combined sulphadiazine and streptomycin and the control of ground squirrels and rodents in California and South Africa have been inserted. The serological diagnosis of enteric fever has been practically re-written and, by omitting the preliminary statement on viruses, 6 pages have been saved.

In chap. 17, the list of mosquitoes capable of transmitting yellow fever, and other ultramicroscopic viruses resembling that of yellow fever, has been amplified. Chap. 22, treating formerly of Colorado Tick fever and Bullis fever, is now enlarged to include epidemic haemorrhagic fever, or red fever of Korea (it has other synonyms) and Izumi fever of Japan.

The preliminary remarks on heat-stroke have been reduced by more than half, thus leaving room for paragraphs on heat-cramp and mammillaria. Chap. 26, on avitaminoses, has been re-arranged, re-cast and partly re-written. In chap. 27, the beautiful coloured plates of the dysenteries, painted by the Editor, have been inserted in the Pellagra chapter as before, but Spillane's aetiological summary of pellagra, beriberi and the acute encephalopathies has been omitted, as have also, in the succeeding chapter, the prophylaxis of scurvy and the methods of preparing pulses in the absence of fresh vegetables. A new chapter on kwashiorkor has been inserted (chap. 29) and in chap. 30 infantile cirrhosis of the liver has been transposed from last to first place. In the cholera chapter (chap. 31) the useful table for differentiating cholera from food poisoning has been omitted; the letterpress of 4 lines is not an adequate substitute. May we hope that the former will be restored in future editions? The use of antibiotics in amoebic dysentery is an important addition to the section on treatment (chap. 32). In the succeeding chapter the table of syndromes characterized by glossitis and stomatitis has been dropped; this will be much regretted by practitioners in the tropics. The diet for convalescents from sprue also no longer finds place. The account of encephalitis japonica (chap. 38) has been extended to include other forms of encephalitis, *e.g.*, that of Murray Valley, and also, as mentioned earlier, acute anterior poliomyelitis, a disease increasing in importance in the tropics. As further evidence of the book being well up to date chap. 43 contains reference to Aitken's recent work on the possible virus causation of tropical eosinophilia.

The illustration of guineaworm in the foot (p. 785) is new, but those of elephantiasis of the vulva and of the breast in the previous edition have been left out. The use of diethylcarbamazine nitrate (Hetrazan) as the anthelmintic of choice for ascariasis is a new insertion (chap. 47) and the section

dealing with convalescence from ankylostomiasis has been enlarged to include MCFADZEAN and WONG's work with Chinese patients and the use of Ferri-venin. The treatment of epidemic dropsy has been re-written. Space has been saved by omitting the drugs used in intravenous and intramuscular injections and the intravenous injection of normal or hypertonic salines (chap. 50). Blood-transfusion sections have been revised and modified and contain remarks on the Rh factor and Rh positive groups.

Presumably in view of the general knowledge of penicillin and its uses, the special chapter on this antibiotic has been discarded, while chap. 52 on DDT and other insecticides has been entirely re-written and is now more comprehensive. The welcome list of drugs used in the tropics, their trade names, chemical composition, dosage and mode of administration has been extended.

In the Appendix the introductory paragraphs on Plasmodiidae have been recast and largely re-written, while the description of the pre-erythrocytic cycle of *P. falciparum* by SHORTT, FAIRLEY, COVELL, SHUTE and GARNHAM is fresh and there is a new illustration of a pre-erythrocytic schizont of *P. falciparum* in the human liver. The list of possible insect transmitters of *T. cruzi* has been enlarged to accord with recent researches, and the sections on *T. rangeli* and *Toxoplasma* have been much amplified.

Wuchereria bancrofti var. *pacifica* of the previous edition (p. 998) is now definitely named *W. pacifica* and it was said that this "may be a separate variety" [although] "as far as can be ascertained, embryos (microfilariae) and adults are morphologically identical with those of *W. bancrofti*", and on p. 993 of the 14th edition, it "might be a separate species" [but is this sufficient reason for according it definite specific rank?]. In the 13th edition (p. 1028) we read: "There are 1,400 species of mosquitoes in the world"; in the new edition (p. 1023): "There are 1,600 species of mosquitoes in the world". Can it be that 200 new species have been discovered in the past 4 years? The *Anopheles* vectors of malaria in different countries and their favourite haunts have been brought up to date and there is a most useful insertion of a table of malaria control giving, by countries, the chief vectors, the intensity of malaria infection, the campaigns against vectors and their results and, in certain cases, the parasite and spleen rates. This will save investigators much dreary search of the literature.

Lack of space precludes mention of many smaller changes, additions and omissions indicating the indefatigable energy of the Editor to whom all praise is due for the production of yet another edition of this deservedly famous book.

H. Harold Scott

PIEKARSKI, Gerhard. *Lehrbuch der Parasitologie unter besonderer Berücksichtigung der Parasiten des Menschen*. [**Manual of Parasitology, with Special Reference to the Parasites of Man**] pp. xii + 760, 411 figs. 1954. Berlin: Göttingen: Heidelberg: Springer-Verlag. [DM 108.]

It requires more than courage, even when combined with a high degree of industry, to undertake a work on parasitology, to bring this great subject up to modern standards and to compress all the information into one volume, but the author has done more for he has drawn analogies with parasites of invertebrates and higher orders of the animal kingdom. Thus this *Lehrbuch* has become more than its title implies and contains the seeds of comparative parasitology.

The student can call to mind several works of international reputation which have specialized on this subject, but it can be claimed that this treatise has at once entered the first rank. It is moreover complete, accurate, up to date and into its creation has gone remarkable assiduity.

The subject-matter is divided into two main parts. The first is devoted to general, the second to specialized parasitology. There are chapters on definitions, symbiosis and palaeozoic parasitology. The parasite is considered in the light of its connexions, then the host and host-parasite relationship. The specificity of parasites can act as a guide to classification of their hosts. Thus, not only do the African and South American ostriches harbour the same tapeworms, but their feather lice are also similar, in spite of the fact that they must have been isolated from the parent stock for many million years.

Parasitic adaptation is another interesting subject of which the commonest and best known is *Pthirus pubis*, the crab louse. There are also learned essays on ecto- and endo-parasites, and a historical review of the development of parasitology with sections on resistance and immunity.

Trypanosomiasis is particularly well handled. It is, for instance, intriguing to learn that the so-called "tissue forms" of *Trypanosoma cruzi* in the lungs of guineapigs which Chagas described were later found to be in reality lung protozoa—*Pneumocystis carinii*. Leishmaniasis is also complete with maps of distribution contrasted with those of the species *Phlebotomus* concerned. Particularly welcome are the descriptions of *Toxoplasma* and *Encephalitozoon*. The Plasmodiidae are treated fully and due recognition is given to the work of RAFFAELE (1934–1936) for having proved for the first time the existence of the EE cycle which has meant so much for malariology.

In amoebiasis consideration is given to the views of German workers—PIEKARSKI recognizes *Entamoeba hartmanni* as the small non-pathogenic species, distinct from *E. histolytica*, but the figures which illustrate the morphological differences are not convincing. The free-living analogue, *Entamoeba moshkovskii*, is not included. Cysts of *Dientamoeba fragilis* are described and figured by the author who, it is claimed, was the first to recognize them. They are oval, binucleated bodies with a definite cell membrane which is too spacious for the contained organism. Attention is drawn to the resemblance of large polynucleated corpuscles to the cysts of *E. histolytica* especially when stained with iron haematoxylin. We must also take note of the change in nomenclature of *Embadomonas* to *Retortomonas*, a terminology which WENYON did not admit.

The spirochaetes are described and classified as bacteria, as the result of electron microscopic studies by the author. The blood spirochaetes are to be known as *Borrelia*, the connective tissue parasites as *Treponema*.

The helminths occupy some 240 pages and the account follows the generally accepted pattern. On p. 256 a novelty is inserted in *Himasthla muchlensi* Vogel, 1933, a parasite of 11–17 mm. in length, which, together with its ova, was found in the faeces of one patient in Hamburg. The intermediary host is thought to be a marine mussel. The account of the schistosomes is very full and contains most of the recent work of VOGEL on this subject. In *Trichobilharzia szidati* Neuhaus, 1952, there is another surprise. This is a parasite of the water-fowl, the cercariae of which give rise to bather's itch in Germany.

An interesting and novel illustration is presented in Fig. 230 which depicts the X-ray appearances of the eosinophilic lung in invasion by *Ascaris* larvae. The changes are said to be allergic in nature. There are also charts of the distribution of the helminthiases and tables of the various sizes of these parasites. A revealing section deals with medicinal and other leeches and especially commendable are the synoptic tables setting forth a list of the main helminths of man and their reservoir and intermediary hosts.

The Arthropods occupy a good deal of space and are expertly handled. On the Ixodidae there is much information not found in other books and the account is illustrated by numerous diagrams and coloured figures. The itch-mite—*Sarcoptes scabiei* Latreille, 1802, has now been renamed *Acarus siro* L., 1758.

Medical entomology is particularly complete and in each form the action of DDT and other insecticides is set forth. Table 28 portrays a list of arthropods as natural transmitters of disease in man and domestic animals and as such will be especially welcome. In the appendix which describes laboratory methods of staining and culture there is a diagram illustrating the relative sizes of pathogenic objects in the faeces (p. 657). A summary of the literature of medical parasitology occupies no less than 53 pages.

The reviewer has been conscious of the high standard of this work throughout this necessarily somewhat inadequate survey. This book is beautifully bound; the printing is on art paper, while the illustrations are beyond cavil and show evidence of great care in their selection. Some mention is necessary of the distribution charts which are liberally interspersed; those taken from CRAIG and FAUST are excellent, but those drawn up by the learned author himself are not so easily decipherable. One criticism the reviewer would be so bold as to make and that is that in a synopsis of the world literature on human parasitology there has been some neglect of the historical aspect. In every comprehensive work of this description there is inevitably a tendency to emphasize the work of one's own people. British workers in parasitology have been pioneers of the first rank. Therefore it is with regret that one misses Professor R. T. LEIPER's classical work on Schistosomiasis in Egypt in 1915, reference to MANSON's original papers on filariasis and malaria, to WENYON's and DOBELL's fundamental researches on amoebae, to AUSTEN's original descriptions of the genus *Glossina* and to SCOTT's monumental *History of Tropical Medicine*.

In other respects workers in this speciality in Britain receive their due credit. The proof reading appears to have been very thorough, but there are inevitably one or two slips: on p. 168 the date of Ross's discovery is given as 1889, and on p. 84 the name of Bentley is misspelt.

Philip Manson-Bahr

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